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PRINCIPLES AND PRACTICE
OF
DENTAL SURGERY.

THE
PRINCIPLES AND PRACTICE
OF
DENTAL SURGERY:

BY
CHAPIN A. HARRIS, M.D.—D.D.S.,

PROFESSOR OF PRACTICAL DENTISTRY AND DENTAL PATHOLOGY IN THE BALTIMORE COLLEGE
OF DENTAL SURGERY; FELLOW OF THE AMERICAN SOCIETY OF DENTAL SURGEONS;
MEMBER OF THE MEDICO-CHIRURGICAL FACULTY OF MARYLAND, ETC. ETC.

SECOND EDITION:
REVISED, MODIFIED, AND GREATLY ENLARGED.



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TO

THOMAS E. BOND, M.D.,

PROFESSOR OF SPECIAL PATHOLOGY AND THERAPEUTICS IN THE BALTIMORE
COLLEGE OF DENTAL SURGERY,

AS A TOKEN OF GRATITUDE FOR MUCH KINDNESS, AND A
TESTIMONY OF RESPECT AND ESTEEM FOR GREAT
PROFESSIONAL AND PRIVATE WORTH,

THIS VOLUME

IS RESPECTFULLY DEDICATED,

BY HIS FRIEND

AND OBEDIENT SERVANT,

THE AUTHOR.



P R E F A C E

TO THE SECOND EDITION.

IN submitting to the profession a Second Edition of his Dental Practice, the author is happy to avail himself of the opportunity to express his grateful appreciation of the approbation which the First has received. He trusts that the additions which he has made to the primary work, will make the one now presented still more acceptable. The alteration in the plan, which has resulted from the effort at improvement, has, however, rendered a slight change of title necessary, in order to express the character of the present book.

In the first edition the Anatomy of the Mouth was omitted, because a thorough knowledge of it can be obtained from works on General Anatomy. But it has been suggested that such works may not be at hand when wanted by the dental student, and the author has thought it better to furnish a description of the several structures which enter into the forma-

tion of this cavity. He has, however, confined himself to brief expositions of the parts; not wishing to encumber the work, or distract the student with the consideration of matters foreign to the purpose for which it was written, and for which, he trusts, it will be read. He is indebted to Bourgery's Anatomy, Quain and Wilson's Anatomical Plates, Wilson's Anatomy, and Smith and Horner's Anatomical Atlas, for a number of the illustrations used in this part of the work.

The second and fifth parts embody the substance of two papers, by the author, which were written subsequently to the publication of the first edition. The subjects of them came properly within the plan of the present work.

The object of the author in the preparation of this edition has been to provide a thorough elementary treatise on Dental Medicine and Surgery, which might be a text book for the student and a guide to the more inexperienced practitioner, and he hopes that the modifications he has introduced, and the additions he has made, will entitle it to be so considered, at least, until an abler hand shall prepare a better.

CHAPIN A. HARRIS.

BALTIMORE, *March* 10, 1845.

CONTENTS.

	Page.
PREFACE,	7

CHAPTER FIRST.

DENTAL SURGERY—ITS PROGRESS IN EUROPE—ITS INTRODUCTION INTO, PROGRESS AND PRESENT CONDITION IN THE UNITED STATES,	13
--	----

CHAPTER SECOND.

IMPORTANCE ATTACHED TO THE HUMAN TEETH, AND CUSTOMS CON- CERNING THEM,	29
---	----

PART FIRST.

ANATOMY AND PHYSIOLOGY OF THE MOUTH,	37
Elements of the Mouth,	ib.

CHAPTER FIRST.

ORGANS OF PREHENSION,	38
1. Levator Labii Superioris alæque nasi,	ib.
2. Levator anguli oris,	ib.
3. Depressor Labii inferioris,	ib.
4. Depressor anguli oris,	ib.
5. Zygomaticus major,	ib.
6. Zygomaticus minor,	ib.
7. Buccinator,	ib.
8. Orbicularis oris,	39
9. Depressor Labii superioris,	ib.
10. Levator Labii inferioris,	ib.
Origin and insertion of these Muscles,	ib.

CHAPTER SECOND

	Page.
ORGANS OF MASTICATION,	41
PASSIVE ORGANS OF MASTICATION,	ib.
1. The Superior Maxillary Bones,	ib.
2. The Inferior Maxillary Bone,	44
3. The Palate Bones,	46
4. The Teeth,	48
Description of Teeth belonging to each class,	53
Articulation of the Teeth,	57
Differences between the temporary and permanent Teeth,	58
ACTIVE ORGANS OF MASTICATION,	ib.
1. The Temporal Muscle,	59
2. The Masseter Muscle,	60
3. Pterygoideus Externus,	61
4. Pterygoideus Internus,	ib.

CHAPTER THIRD.

ORGANS OF INSALIVATION,	63
1. The Parotid Gland,	ib.
2. The Sub-maxillary Glands,	64
3. The Sub-lingual Glands,	65
4. The Mucus Glands,	ib.

CHAPTER FOURTH.

ORGANS OF DEGLUTITION,	66
The Pharynx,	ib.
The Soft Palate,	68
The Tongue,	71
Mucus Membrane of the Mouth,	74
The Gums,	76
The Alveolo-dental Periosteum,	ib.

CHAPTER FIFTH.

BLOOD-VESSELS OF THE MOUTH,	78
The Internal Carotid Artery,	79
The External Carotid Artery,	ib.
The Arteries of Prehension,	ib.
The Arteries of Mastication,	80
The Arteries of Insalivation,	81
The Arteries of Deglutition,	82
The Veins,	83
Branches of the External Carotid Artery as they arise in numerical order,	ib.

CONTENTS.

xi

CHAPTER SIXTH.

	Page.
NERVES OF THE MOUTH,	84
The Superior Maxillary Nerve,	86
The Inferior Maxillary Nerve,	89
Anatomical Relations of the Mouth,	93
Physiological Relations of the Mouth,	94

CHAPTER SEVENTH.

ORIGIN AND FORMATION OF THE TEETH,	96
Formation of the Enamel of the Teeth,	106

CHAPTER EIGHTH.

FIRST DENTITION,	110
Eruption of the temporary Teeth,	ib.
Effects resulting from First Dentition,	113
Importance of the preservation of the temporary Teeth,	117

CHAPTER NINTH.

SECOND DENTITION,	123
Shedding of the temporary Teeth,	125
Eruption of the permanent Teeth,	129
Accretion of the Jaws,	130
Management of Second Dentition,	134

CHAPTER TENTH.

IRREGULARITY OF THE TEETH,	140
Treatment of irregularity of the Teeth,	143

CHAPTER ELEVENTH.

PECULIARITIES IN THE FORMATION AND GROWTH OF THE TEETH,	155
---	-----

CHAPTER TWELFTH.

OSSEOUS UNION OF THE TEETH,	159
---------------------------------------	-----

CHAPTER THIRTEENTH.

SUPERNUMERARY TEETH,	161
--------------------------------	-----

CHAPTER FOURTEENTH.

THIRD SET OF TEETH,	163
-------------------------------	-----

PART SECOND.

	Page.
PHYSICAL CHARACTERISTICS OF THE TEETH, GUMS, SALIVARY CALCULUS, &c.,	167

CHAPTER FIRST.

GENERAL CONSIDERATIONS,	169
-----------------------------------	-----

CHAPTER SECOND.

PHYSICAL CHARACTERISTICS OF THE TEETH,	184
--	-----

CHAPTER THIRD.

PHYSICAL CHARACTERISTICS OF THE GUMS,	197
---	-----

CHAPTER FOURTH.

PHYSICAL CHARACTERISTICS OF SALIVARY CALCULUS,	208
--	-----

CHAPTER FIFTH.

PHYSICAL CHARACTERISTICS OF THE FLUIDS OF THE MOUTH,	213
--	-----

CHAPTER SIXTH.

PHYSICAL CHARACTERISTICS OF THE LIPS,	216
---	-----

CHAPTER SEVENTH.

PHYSICAL CHARACTERISTICS OF THE TONGUE,	219
---	-----

PART THIRD.

DISEASES OF THE TEETH,	227
----------------------------------	-----

CHAPTER FIRST.

CARIES OF THE TEETH,	228
Differences in the liability of different Teeth to decay,	231
Causes of Caries,	236
Prevention of Caries,	241

CHAPTER SECOND.

	Page.
TREATMENT OF CARIES,	243
Filing the Teeth,	244
Plugging or Filling Teeth,	253
Materials employed for Filling Teeth,	257
Tin,	258
Lead,	ib.
Gum Mastic,	ib.
Silver,	ib.
Alloy of Bismuth, Tin and Lead,	259
Amalgam of Mercury and Silver,	ib.
Platina,	260
Gold,	ib.
Formation of the Cavity,	ib.
Instruments for and manner of introducing the Plug,	263

CHAPTER THIRD.

TOOTH-ACHE,	267
Causes,	ib.
Treatment,	270

CHAPTER FOURTH.

OF THE EXTRACTION OF TEETH,	274
Instruments employed in the operation,	276
The Key Instrument,	ib.
The Forceps,	277
Manner of using the Key Instrument,	284
Manner of using the Forceps,	286
Of the manner of Extracting Roots of Teeth,	290
Excessive Hæmorrhage after Extraction,	294

CHAPTER FIFTH.

ATROPHY OF THE TEETH,	297
Causes,	298
Treatment,	299

CHAPTER SIXTH.

NECROSIS OF THE TEETH,	300
Causes,	301
Treatment,	302

CHAPTER SEVENTH.

	Page.
EXOSTOSIS OF THE ROOTS OF THE TEETH,	303
Causes,	304
Treatment,	ib.

CHAPTER EIGHTH.

SPINA VENTOSA,	305
Causes,	306
Treatment,	ib.

CHAPTER NINTH.

THE DENUING PROCESS,	307
Causes,	ib.
Treatment,	309

CHAPTER TENTH.

SPONTANEOUS ABRASION OF THE CUTTING EDGES OF THE TEETH,	310
Causes,	312
Treatment,	ib.
Mechanical Abrasion of the Teeth,	313

CHAPTER ELEVENTH.

FRACTURES AND OTHER INJURIES OF THE TEETH FROM MECHANICAL VIOLENCE,	315
---	-----

CHAPTER TWELFTH.

FUNGUS GROWTH OF THE PULP OF A TOOTH,	318
---	-----

PART FOURTH.

SALIVARY CALCULUS—DISEASES OF THE GUMS, &c.	319
---	-----

CHAPTER FIRST.

SALIVARY CALCULUS,	321
Its Composition,	ib.
The origin and manner of its Formation,	322
Its effects upon the Teeth, Gums, and Alveolar Processes,	327
Manner of removing it,	328

CHAPTER SECOND.

	Page.
DISEASES OF THE GUMS,	331
Inflammation and sponginess of the Gums, accompanied by recession of their Margins, and destruction of the Alveolar Processes,	333
Causes,	335
Treatment,	338

CHAPTER THIRD.

PRETERNATURAL PRURIENT GROWTH OF THE GUMS,	344
Causes,	ib.
Treatment,	345

CHAPTER FOURTH.

SPONTANEOUS ULCERATION OF THE GUMS OF CHILDREN, . . .	347
Causes,	348
Treatment,	349

CHAPTER FIFTH.

TUMORS AND EXCRESCENCES OF THE GUMS AND ALVEOLAR PROCESSES, .	351
Causes,	352
Treatment,	353

CHAPTER SIXTH.

ALVEOLAR ABSCESS,	361
Causes,	362
Treatment,	ib.

CHAPTER SEVENTH.

NECROSIS AND EXFOLIATION OF THE ALVEOLAR PROCESSES, . .	367
Causes,	368
Treatment,	ib.

CHAPTER EIGHTH.

SPONTANEOUS DESTRUCTION OF THE ALVEOLAR PROCESSES, . .	370
Causes,	ib.
Treatment,	371

CHAPTER NINTH.

	Page.
DISPLACEMENT OF THE TEETH BY A DEPOSITE OF BONE IN THEIR	
SOCKETS,	372
Causes,	373
Treatment,	ib.

CHAPTER TENTH.

EFFECTS OF MERCURY, TOBACCO AND SNUFF UPON THE TEETH,	
GUMS, &c.	375
Effects of Mercury,	ib.
Effects of Tobacco,	378
Effects of Snuff,	379

CHAPTER ELEVENTH.

EFFECTS OF DISEASED TEETH AND GUMS ON THE GENERAL HEALTH,	381
Case 1st,	389
Case 2d,	391
Case 3d,	393
Case 4th,	394
Case 5th,	395
Case 6th,	397
Case 7th,	398
Case 8th,	399
Case 9th,	402
Remarks,	405

PART FIFTH.

DISEASES OF THE MAXILLARY SINUS,	407
--	-----

CHAPTER FIRST.

PRELIMINARY REMARKS,	409
--------------------------------	-----

CHAPTER SECOND.

INFLAMMATION OF THE LINING MEMBRANE,	420
Symptoms,	422
Causes,	423
Treatment,	425
Case 1st,	426
Case 2d,	ib.
Case 3d,	427

CONTENTS.

xvii

CHAPTER THIRD.

	Page.
PURULENT CONDITION OF ITS SECRETIONS AND ENGORGEMENT,	430
Symptoms,	434
Causes,	436
Treatment,	437
Case 4th,	446
Case 5th,	447
Case 6th,	448
Case 7th,	449
Case 8th,	ib.
Case 9th,	450
Case 10th,	451
Case 11th,	453
Case 12th,	455
Case 13th,	456
Case 14th,	ib.

CHAPTER FOURTH.

ABSCCESS,	458
Symptoms,	461
Causes,	462
Treatment,	ib.
Case 15th,	463
Case 16th,	466

CHAPTER FIFTH.

ULCERATION OF THE LINING MEMBRANE,	470
Symptoms,	472
Causes,	473
Treatment,	474
Case 17th,	475
Case 18th,	478

CHAPTER SIXTH.

CARIES, NECROSIS AND SOFTENING OF ITS BONY PARIETES,	481
Symptoms,	483
Causes,	484
Treatment,	485
Case 19th,	488
Case 20th,	489

CHAPTER SEVENTH.

	Page.
TUMORS OF ITS LINING MEMBRANE AND PERIOSTEUM,	491
Symptoms,	494
Causes,	496
Treatment,	ib.
Case 21st,	500
Case 22d,	501
Case 23d,	502
Case 24th,	504
Case 25th,	505

CHAPTER EIGHTH.

EXOSTOSES OF ITS OSSEOUS PARIETES,	513
Symptoms,	516
Causes,	517
Treatment,	ib.
Case 26th,	518
Case 27th,	520

CHAPTER NINTH.

WOUNDS OF ITS OSSEOUS PARIETES,	522
Treatment,	523
Case 28th,	ib.

CHAPTER TENTH.

FOREIGN BODIES IN IT,	526
Symptoms,	527
Treatment,	528

PART SIXTH.

MECHANICAL DENTISTRY,	531
---------------------------------	-----

CHAPTER FIRST.

ARTIFICIAL TEETH,	532
Substances employed for Artificial Teeth,	536
Human Teeth,	ib.
Teeth of Cattle,	537

CONTENTS.

xiX

	Page.
Teeth of Ivory and the Tusk of the Hippopotamus,	538
Porcelain Teeth,	540
Surgical treatment of the Mouth preparatory to the insertion of Artificial Teeth,	542

CHAPTER SECOND.

DIFFERENT METHODS OF APPLYING ARTIFICIAL TEETH,	545
Application of Artificial Teeth to Natural Roots,	ib.
Application of Artificial Teeth on Plate with Clasps,	550
Artificial Teeth with Spiral Springs,	551
Atmospheric Pressure and Capillary Attraction method of applying Artificial Teeth,	552
Ligature Method of applying Artificial Teeth,	555
Transplanting method of inserting Artificial Teeth,	558

CHAPTER THIRD.

MANNER OF PREPARING A NATURAL ROOT AND INSERTING A PIVOT TOOTH,	562
---	-----

CHAPTER FOURTH.

MANNER OF FITTING A PLATE, ATTACHING CLASPS AND PORCELAIN TEETH TO IT,	570
Self-Acting Blow-pipe,	574

CHAPTER FIFTH.

CONSTRUCTION OF DENTAL SUBSTITUTES FOR SPECIAL CASES,	585
Substitute for an upper Lateral Incisor,	ib.
Substitute for two upper Central Incisors,	586
Substitute for the upper Incisors and Cuspidati,	587
Substitute for two upper Bicuspidates,	ib.
Substitute for the Incisors, Cuspidati and Bicuspidates of the upper jaw,	588
Substitute for all the upper Teeth except one Molaris,	ib.
Substitute for the two Lateral Incisors, two Bicuspidates, and the first Molaris on the left side of the mouth in the upper jaw,	589

CHAPTER SIXTH.

CONSTRUCTION OF A DOUBLE SET OF ARTIFICIAL TEETH WITH SPIRAL SPRINGS,	590
---	-----

CHAPTER SEVENTH.

	Page.
CONSTRUCTION OF DENTAL SUBSTITUTES ON THE ATMOSPHERIC	
PRESSURE PRINCIPLE,	594

CHAPTER EIGHTH.

MANNER OF ATTACHING NATURAL TEETH TO A PLATE,	596
---	-----



CONCLUSION,	597
-----------------------	-----

PRINCIPLES AND PRACTICE
OF
DENTAL SURGERY.

CHAPTER FIRST.

DENTAL SURGERY—ITS PROGRESS IN EUROPE—ITS INTRODUCTION INTO, PROGRESS AND PRESENT CONDITION IN THE UNITED STATES.

THE practice of Dental Surgery and a high state of refinement and learning, ever have been, and ever will be, cotemporaneous. When the Greek historian, HERODOTUS, went to Egypt, from his then comparatively barbarous Grecian home, to learn the sacred mysteries and the sciences in the world's earliest nursery of learning and civilization on the banks of the Nile, he found Surgery and Medicine divided into distinct professions. There were Surgico-physicians for the eye, others for the ear, others for the teeth, and so on for the different classes of disease the appropriate professor was found. This division, by an unalterable law of the human mind, would have given great skill and efficiency to the various practitioners, had not each been confined, under a penalty of death, to fixed prescriptions; but as to what extent the remedies and modes of practice at this early period of the world's history were successful in the cure of disease, the chasms made in the annals of ancient art and science, by the destruction of the Alexandrian library, must forever leave the world in ignorance. Yet, it must be conceived honourable to Dentistry, that the best writings of ancient times on the art, now extant, are those of GALEN, who wrote in the second century after

Christ, after having enjoyed the Medical advantages afforded by that eldest and most splendid of libraries, which was so soon afterwards doomed to the flames by the hand of barbarian power.

Greece and Rome, in their most palmy days of splendor and prosperity, cultivated the art of Dentistry, chiefly in aid of the charms of beauty, but to what extent, from the paucity of Medical works which those nations left behind them, it is impossible to determine. When Vandalism shut down upon the world, and learning itself was hidden in the gloom of the dark ages, then every torch light of science feebly glimmering over the waste of ignorance and superstition, and every star that shone in the moral and scientific horizon were quenched in that chill night of ages which threw its deadly penumbra over the world.

During this pause in the vitality of learning, Dentistry fared no worse than any other science. Demonology and the curative art were antagonistic, and the cabalistic mummary of gloomy and monastic ascetics was called in, to eradicate pain and disease, by the aid of charms and incantations—remedies that piety ever considered worse than the sufferings of bodily sickness.

Near three hundred years ago, about the time of the revival of letters, AMBROSE PARE, in his celebrated work on Surgery, gave evidence of the vitality of Dentistry amidst the awakening chaos of ancient science and erudition. His remarks upon the teeth, were a promise of what the present age is fulfilling in this department of physical alleviation—yet they were intermixed with numerous absurdities and improbabilities, which half-awakened science had not yet shaken off, as she was slowly rousing herself for her final, her noblest triumphs.

Paré wrote in 1579, and in 1771 JOHN HUNTER wrote the first, and in 1778, the second part of his celebrated treatise on the teeth, on which the broad and firm foundation of the English School of Dentistry was laid. This has subsequently been improved and beautified by BLAKE, FOX, KOECKER, BELL, SNELL, WAITE, NASMYTH, and other distinguished men of the Dental profession.

What that eminent Anatomist and Surgeon, John Hunter, was to the English School of Dentists, BICHAT was to the French modern school, as he, with others equally philosophic, taught that

no theory should be received, however plausible, which could not be worked out by demonstration and experiment. Neither Hunter nor Bichat were practical Dentists—but the mighty energy of their minds embraced the Dental with the other branches of Surgery; and the principles of physiology and pathology at large included this important branch, and revealed the connection and sympathies of the teeth with the entire framework of man. Blandin, Bichat's Editor, although not a practical Dentist, was much better acquainted with the science of the teeth than Bichat himself: and CUVIER's extensive researches into osteology, as well as the arcana of nature at large, all came in to aid the French Dental Surgeons. SERRES, HERRISSANT, F. CUVIER, ROUSSEAU, MAURY, and LEFOULON, have illustrated the modern improvements of the art and science, building as they have, on the foundation laid years before by FAUCHARD, BUNON, BOURDET, JOURDAIN, BAUME, LAFORGUE, DUVAL, DELABARRE and others.

But to enter more into detail with regard to the progress of Dental Surgery in Europe, it may be well to observe that it was not until about the year 1700, that the art attracted much attention or assumed a distinctive character from the other professions of Medicine. Previous to this period, the anatomy, physiology and even pathology of the teeth, had, it is true, made some progress in France, but the treatment of their diseases and the substitution of their loss with artificial ones, were but very imperfectly understood. The few who attempted to practice the art did it in such a rude and clumsy manner, that their operations were, for the most part, productive of greater evils than those which they were intended to remedy.

During the eighteenth century, however, it became a subject of more critical inquiry and thorough investigation. It was now cultivated in England and France by men of talent, as the names of the distinguished individuals already mentioned, abundantly prove. A number of elaborate works, treating exclusively upon the subject, emanated from the press during this period. But notwithstanding the numerous contributions that were made to the literature of the art, and the number of scientific and ingenious individuals engaged in its practice, it had not, even to the close of the

eighteenth century, attained to a very high state of excellence. Although the curative indications of many of the diseases of the teeth seem to have been well understood previously to this time, yet very few surgeons had acquired a sufficient degree of skill to enable them to arrest their progress.

But a brighter era in this département of Surgery commenced with the ushering in of the present century. Its progress, from this time, was destined to be more rapid. Profiting by the experience of the past, as well as by the spirit of enterprize and improvement which was now rapidly diffusing itself abroad over the civilized world, and nerving the energies of mind for new and greater achievements in every department of science and art, a few of the practitioners of Dental Surgery, animated by a spirit of noble emulation, devoted themselves to its cultivation with an enthusiasm and zeal that faltered not at any obstacle that interposed between them and the summit of professional excellence.

The publication in France, in 1800, of PROFESSOR BAUME'S elaborate treatise on first dentition and the diseases that accompany it, was followed two years afterward by a work on the theory and practice of the art by LAFORGUE. But neither of these works, although they both contain much valuable practical information, is free from errors. The first has recently been translated into English by Professor Bond, and published in the library part of the American Journal of Dental Science. Laforgue is, for the most part, a very accurate observer, and has contributed several very interesting works to the literature of the art. Besides a treatise on the semeiology of the mouth, which was published in 1806, he is the author of a series of articles on the diseases of the teeth, which issued from the press in 1808, and a dissertation on first dentition published in 1809.

About the same time several interesting works from the pen of DUVAL, an accomplished French writer, were published. His "*Le Dentiste de la Jeunesse*," has been extensively read and much admired. In his counsels of the ancient poets on the preservation of the teeth, he has displayed much curious and singular research. In 1820, he wrote a small work on second dentition, and in 1828, a Treatise on Mechanical Dentistry. Besides these, he is the author of some eight or ten other well written papers on the teeth.

GARIOT wrote a work on the diseases of the mouth, which was published in 1805. The year following LEROY (*de la Faudiguere*) wrote a work on the diseases of the gums. The first of these works was, about two years ago, translated into English by Dr. J. B. Savier, and published in the American Journal of Dental Science. In 1807, MAGGIOLO wrote a treatise entitled "the Art of the Dentist," which at the time was quite popular.

The next work which I shall mention is from the pen of C. F. DELABARRE, and is entitled "Odontology." This treatise was published in 1815, and abounds with much valuable information. The Treatise on Second Dentition by the same author, published in 1819, is one of the best works on the subject that has ever appeared. Besides treating on Second Dentition, it has one chapter on Salivary Calculus, and one on the Semciology of the Mouth. To the pen of Delabarre the science and art of Dental Surgery are probably as largely indebted as to that of any other individual; and while many of the views which he advances are evidently erroneous, his opinions are, for the most part, entitled to respect. In 1820, he wrote a Treatise on Mechanical Dentistry, illustrated with forty-two plates, and in 1826 he wrote a supplement of near one hundred pages to his Treatise on Second Dentition.

LEMAIRE, a French author of some note, wrote a Manual on the Anatomy and Physiology of the Teeth, and a Treatise on Dental Physiology and Pathology. The first of these works was published in 1816, and the last in 1822. A Treatise on the Anatomy, Physiology and Dentition of the Teeth, by SERRES, was published in 1819, and attracted, at the time, considerable attention. Some of his physiological opinions have been severely handled, and the justness of his claims to anatomical discoveries, which he pretends to have made, questioned.

It may be well to mention here, that during the first fifteen or twenty years of the present century several pamphlets on the manufacture and employment of porcelain artificial teeth were published in France. AUDIBRAN wrote a work of near two hundred pages upon the subject, which was published in 1821. The credit of this invention belongs to DUCHATEAU, an Apothecary of St. Germain. Although manufactured and used for nearly a quarter of a century in France previously to their introduction into the

United States, it was here that they were brought to their present high state of perfection.

Although interesting only in a physiological point of view, F. CUVIER's work should not be passed without notice. It was published in 1825, and treats upon the teeth of mammiferous animals considered in their zoological characters. It is illustrated with one hundred plates.

The Art of Directing the Second Dentition, by MIEL, is the title of a work published in 1826, and in 1828 a treatise was published on the Comparative Anatomy of the Teeth of Man and other Animals, by ROUSSEAU, and is one of the best works extant upon the subject. It is well written, and characterized by great depth of research. Rousseau is also the author of a small Treatise on First and Second Dentition, which was published in 1820. MAURY is the author of a Treatise on Dental Surgery, which has passed through several editions in France; it has also recently been translated into English by Dr. J. B. Savier, and published by Messrs. Lea and Blanchard, of Philadelphia. A very valuable Treatise on Dental Anatomy, by PROFESSOR BLANDIN, was published in 1836. This work, though not large, deserves to be ranked among the first upon the subject.

A work on the Theory and Practice of Dental Surgery, by LEFOULON, was published in 1841. It contains between five and six hundred pages, and a translation of it by Professor Bond, is now in the course of publication in the American Journal of Dental Science. I shall notice at this time but one other French work, and that is a Treatise on the Treatment of Irregularity of Teeth, by SCHANGÉ. It was published in 1842.

To the foregoing works, many more might be added, but these will suffice to show the progress which the science and art of Dental Surgery has made in France during the last forty-five years. The French have written much upon the subject, and have contributed greatly to its advancement; they were its earliest and for a long time its most zealous cultivators.

Leaving the French School, I shall proceed to examine very briefly, the progress which it has made during the same time in Great Britain. The publication of Dr. BLAKE's "Inaugural Dis-

sertation on the Structure of the Teeth in Man and various Animals," in 1798, was followed in 1803 by the first part of Fox's celebrated treatise on the "Natural History and Diseases of the Human Teeth," and in 1806 by the second part. This work has held a deservedly high place in the literature of this department of physical alleviation. It has been quoted from by almost every subsequent writer, and the portion of it which treats upon the anatomy and physiology of teeth, ranks even now, with the best works upon the subject. The doctrine of the diseases of the teeth, as promulgated by the distinguished author, although even now maintained by several very able European writers, is denied by others of equal acumen and ability. Its advocates have displayed great talent and ingenuity in its support, but its opponents have adduced arguments and facts so conclusive against it, that all doubt upon the subject would seem to be set at rest. Therapeutical Dentistry was not very well understood at the time of the publication of this work, consequently, but little information of value on this subject is contained in it.

Four years after the publication of Mr. Fox's work, a treatise by FULLER, on the "Structure, Formation and Management of the Teeth," was issued from the press; and the year following, a volume by MURPHY, entitled, "Natural History of the Human Teeth," with a treatise on their diseases from infancy to old age, was published. These works, however, are intended for the general reader, rather than the professional Dentist. In 1819, a treatise by BEW, and in 1823, another by GERBAUX, were published.

But the best work on Dental pathology and therapeutics that had issued from the English press, up to the year 1826, is from the pen of that skilful and scientific practitioner, LEONARD KOECKER, M. D. and is entitled "Principles of Dental Surgery." This is a valuable work, and has contributed in an eminent degree to the success that attends the practice at present pursued in the treatment of Dental diseases. A work from the same author on the diseases of the jaws, was published in 1828; and another in 1835, on artificial teeth, obturators and palates.

In 1827, MR. FAY made public through the medium of a small

work, a mode of using forceps invented by himself for the extraction and excision of teeth. The advantages proposed by this last operation have not been realized, and it is now altogether abandoned. A small treatise on the diseases of the teeth, by J. P. CLARK, was published in 1831. In this, the author advocates the doctrine that Dental caries is the result of the action of external corrosive agents.

One of the most popular English works that has yet appeared, is from the pen of Mr. THOMAS BELL, an able and highly accomplished writer. It was published in 1830, and in 1831 it was followed by Mr. SNELL's treatise on operative Dental Surgery, a very excellent work. Three years after the publication of this last work, a treatise on the diseases of the teeth by Mr. ROBERTSON, was issued from the press, in which the doctrine that the decay of these organs is attributable to the action of external solvent agents, is advocated; and another on the Anatomy, Physiology, and Diseases of the Teeth by Mr. JOBSON.

Subsequently to the publication of the foregoing, several other works of various degrees of merit have made their appearance in England, among which are NASMYTH's "Historical Introduction" to his researches on the development, &c. of the teeth, three memoirs by the same author, on the "Development and Structure of the Teeth and Epithelium," "Structure, Economy and Pathology of the Human Teeth," by W. LINTOT, and a small work on the extraction of the teeth by CLENDON, also parts first and second of a large work by PROFESSOR OWEN, entitled "Odontography."

I have omitted two works which should have been mentioned before. Both of which are by G. WAITE. One is on the anatomy of the teeth, and the other on the diseases of the gums. They are interesting and valuable works. Many more might be added to this list, but enough has been enumerated to show that the progress of Dental Surgery in England, since the year 1800, has kept pace with its advance upon the Continent.

In Germany, though its progress there has been less rapid, it has attracted considerable attention, and from that country a number of works, some of considerable value, have emanated.

The researches of PROFESSOR RETZIUS, of Sweden, have excited much attention in Europe, and though they do not go to confirm

previous opinions in regard to the structure of the teeth, they have nevertheless thrown much light upon the subject. They consist of microscopic examinations of the teeth of man and other animals, conducted upon an extensive scale, and would seem to prove the structure of these organs to be tubular. A translation of the account of the microscopical researches of this author is contained in Nasmyth's "Historical Introduction," as well also as those of PURKINJE and MULLER, on the same subject.

Having said thus much concerning the progress of Dental Surgery in Europe, I shall now proceed to notice its introduction and growth in the United States.

It was during our revolutionary struggle for independence, that the first knowledge of Dental Surgery was introduced into this country, and the first Dentist in the United States, of whom we have any account, was a man by the name of LE MAIR, who accompanied the French army which came over to our aid during that period. Soon after the arrival of Le Mair, a Dentist by the name of WHITLOCK came over from England, and from him and Le Mair, who had preceded him but a very short time, Dental Surgery may be said to have had its origin in the United States. But as yet, so far as I have been able to ascertain, no regular treatise upon the subject had found its way to this country. With regard to the professional abilities of Le Mair and Whitlock, little is known, but it is probable that they were limited, and that their practice consisted chiefly in the carving of artificial teeth from blocks of ivory.

MR. JOHN GREENWOOD, however, I believe was the first native American Dentist; and he commenced practice in New York about the year 1788, and is said to have been the only Dentist in that city in the year 1790. Possessed of great energy of character and ingenuity of mind, he rapidly acquired reputation in the profession. About the year 1790 he constructed an entire Dental apparatus for GENERAL WASHINGTON, and in 1795 another, which, for ingenuity of design and neatness of execution, was unsurpassed by any of the European artificial teeth of that period. They were carved from ivory and secured in the mouth by spiral springs. The first, after having been worn about five years,

became injured, and were returned to Mr. Greenwood, who replaced them with another set. Half of the upper circle of the first, together with an original letter, acknowledging the receipt of the second, were presented to the author while on a visit to New York about two years ago, by DR. ISAAC I. GREENWOOD, son of the late Mr. John Greenwood, and are at this time in his possession.

But Mr. Greenwood did not remain long alone in the profession in New York; he was joined about the year 1794 by MR. WOOFENDALE, from London.

But previously to this time, a DR. SPENCE, who had obtained some instructions from Le Mair, commenced practice in Philadelphia. In the mean time the works of Hunter and some French authors, having been brought to this country, contributed in no small degree to awaken increased zeal in the cultivation of the art. It is also probable that a small popular treatise by Mr. Woofendale, published in England before he came to America, had found its way through its author to the hands of other Dentists here.

About the time that Dr. Spence commenced practice in Philadelphia, the profession received a valuable accession to its ranks, which at this time numbered but few in the United States, in the late DR. GARDETTE, who came over from France, where, if the author is correctly informed, he had previously received the instructions of some of the best Dentists of Paris. Dr. Gardette soon acquired great reputation, which he enjoyed to the day of his death.

Not many years after the arrival of Dr. Gardette in Philadelphia, Dr. Hudson, Dentist of Dublin, came to this country and settled in that city, where he acquired a reputation not surpassed by any other Dentist of his day.

But the practice of Dental Surgery in the United States, up to about the year 1800, consisted for the most part, in extracting, cleaning and filing the natural teeth, and the replacing of these when lost with artificial ones, constructed chiefly from ivory.

From this period, however, Dental Surgery began to be cultivated as a science, and as an important branch of the curative art. The preservation of the natural teeth began now to be re-

garded as of more importance than the insertion of artificial ones. To the cure of the diseases of these organs, Hudson, especially, devoted the powers of his vigorous and well disciplined mind, and soon demonstrated the practicability of arresting the progress of Dental caries, and in its treatment, his skill was for a long time, almost unequalled.

In the year 1800, DR. H. H. HAYDEN commenced the practice of Dental Surgery in Baltimore, and being possessed of an enquiring mind, he devoted himself to its study with a zeal manifested but by few in the profession. With the works of very many of the earlier, and nearly all of the later writers, he was familiar, and during his life contributed several ingenious papers upon the subject. In 1807, DR. KEEFER, now of London, also commenced practice in Baltimore, but shortly after moved to Philadelphia, where he remained the most of the time, until about the year 1822, when he settled where he now resides. But before he left this country, he had acquired a deservedly high reputation for skill in the treatment of the diseases of the teeth and those of their contiguous parts.

But from the year 1790 to 1807, many others had entered the profession, yet the accessions up to the last mentioned period, were by no means numerous, and so slowly did its ranks fill, that even up to 1820, the whole number of Dental practitioners in the United States, had not greatly exceeded one hundred. From this time, however, they began to increase more rapidly, and although many, perhaps nine-tenths, of those who assumed the calling, did so with little or no preparatory study or instruction; the zeal and ability with which the art was cultivated by others, hastened it on toward perfection with astonishing and unexampled rapidity.

In 1830, the number of Dentists in the United States, according to the best information which the author has been able to obtain, was about three hundred, but of these, not more perhaps, than forty or fifty had attained to much knowledge in any of the departments of the art. The portals to the profession then, as now, were open to the ignorant as well as to the educated, and in consequence of this, its members multiplied rapidly. In the course

of five years from the period last mentioned, the number of Dentists in the United States had more than doubled.

But an event was now approaching in the history of Dental Surgery in the United States, which gave to its progress a new and unexpected impetus. It was the establishing of the American Journal and Library of Dental Science, which took place in 1839. This was the rising of the morning star of improvement, and was soon followed with more palpable evidences of the approach of daylight to the scattered members of the profession, who had long toiled in comparative obscurity, almost unknown to each other and to the world. The Journal aroused the dormant energies of scores, who had learned much of the science and art in years of toil; but who had not before found any appropriate medium through which to communicate their knowledge to the profession.

The formation of the American Society of Dental Surgeons soon followed the establishment of this periodical, and at its second annual meeting an arrangement was made with the publishers, by which it became both the property and the organ of the association. Since then, the agency of the Journal in recording the transactions of the Society, in presenting the papers and the addresses, read before it at its annual meetings, the discoveries and improvements in the art, as well as in the diffusion of the knowledge of foreign acquirements in this branch of Surgery—has marked it as the chief ally of the Society in the elevation of the profession, and in giving vigor to its associated efforts for the advancement of the science. And the fact that it has become the medium of intercommunication between its members, and the repository of valuable information, should commend it to the brotherhood generally.

But a few months previous to the institution of the American Society of Dental Surgeons, the legislature of Maryland chartered a college with four professorships, for the purpose of affording more ample facilities of instruction in the branches of knowledge necessary to the education of an accomplished Dentist, than could be furnished by any private teacher, and thus securing to the public a sure guaranty against the impositions of empiricism. The object of this institution is, to give those who receive its instructions, a thorough Medico-dental education, so

that when they enter upon the active duties of the profession, they may be enabled to practice it, not alone as a mere mechanical art, but upon sound scientific principles, as a regular branch of medicine. While the head is being educated in such branches of general medicine and Surgery, as is deemed necessary to a successful practitioner in this department, and in the principles proper of Dentistry, the fingers of the Student, are, at the same time, regularly drilled every day in the various mechanical manipulations belonging to it, so that those who graduate in the Baltimore College of Dental Surgery, go out with advantages that can seldom be obtained from private instruction. This fact, it is believed, will ever connect the destinies of the Institution with the welfare of the profession in this country.

Nor will its salutary influence stop here. It will be felt in other countries, and will be instrumental in elevating the standard of Dental qualifications every where.

A little more than two years after the establishment of the Baltimore College of Dental Surgery, a convention of Dentists was held in Richmond, Virginia, which resulted in the formation of a Society, similar to the American, and from the character and professional standing of most of the gentlemen who compose it, and the zeal they manifest in the cultivation of the art, it can hardly be otherwise than that much good will result from their associated efforts to advance its progress.

The example set by the institution of the American and Virginia Societies, was followed in August, 1844, by the formation, at Cincinnati, Ohio, of the "Mississippi Valley Association of Dental Surgeons," which, from the known abilities and reputation of many of its members, will doubtless contribute its full share to the advancement of scientific Dentistry in the United States.

According to the best calculation that has been made, there were in 1842, about fourteen hundred Dentists in the United States, but since that time the number has somewhat decreased, owing, no doubt, to the efforts of the last few years to elevate the standard of professional qualification. Many, very many, of those engaged in the practice at present, possess but few, and some none, of the necessary qualifications for it, but there are a great number who have overcome the difficulties with which they had

to contend in the early part of their professional career, and by their persevering application in the pursuit of knowledge, have attained the highest standard of excellence and established for themselves claims to skill, unsurpassed by any European practitioners.

As I have stated on another occasion, I repeat, there is something beautiful in the contemplation of the introduction and growth of the Dental science in the United States. From Europe the first glimmering lights of the profession, as has been shown, were introduced almost by chance, like wandering rays from a distant source. But those rays fell upon a country full of the boundless materials of science—a luxuriant field for its development—an enterprising, inventive people—and no wonder that the result has been the astonishing perfection to which it has now attained. The numerous and highly important improvements that have been made, both in theoretical and practical Dental Surgery, in this country, during the last ten years, indicate the stand American Dentistry is expected to take on the broad theatre of the world, amidst the national rivalry of the elder continent, the hoary home of the arts and sciences, when our land was hidden from the race of man by an untraversed ocean and boundless forest.

The highest and most ardent ambition should be cherished by the Dental profession in this country, “redeeming the time,” and putting each moment to its appropriate use. Ten years ago, an accomplished Dentist might have been pardoned for the thought that his art had arrived at perfection; but what astonishing improvements and discoveries have been made in this department of Surgery within that time, and who shall say that the succeeding ten years shall not be as pregnant with improvements as the past.

Although there has not been quite as much written in the United States as in Europe, on the science and art of Dental Surgery, Dentistry has nevertheless progressed with as much rapidity here as there, and the works of American authors upon this subject, would suffer but little, if at all, by comparison with similar publications of other countries. But few elementary works on the subject have ever been published any where, and of those purporting to be such which have appeared during the last fifteen or twenty years, this country has furnished as many as any other.

But of American authors on Dentistry, I shall only mention the names of a few. Dr. J. GARDETTE, wrote a small treatise on the subject which was published in 1821, and Dr. ELEAZAR PARMLY is the author of a very excellent popular essay of near a hundred pages, on the "Disorders and Treatment of the Teeth," published almost simultaneously in New York and London, in 1822. Dr. L. S. PARMLY is the author of two small volumes, containing much valuable popular information, which were also published in 1822, as was a work, entitled "The Family Dentist, containing a brief description of the Structure, Formation, Diseases and Treatment of the Human Teeth," by J. F. FLAGG, M. D.

In 1828, Dr. J. TRENOR wrote a small work on the "Structure or Organization and Nourishment of the Human Teeth;" and in 1829, a work was published of upwards of five hundred octavo pages, entitled "A System of Dental Surgery, in three parts." The first, "Dental Surgery as a Science," the second, "Operative Dental Surgery," and the third, "Pharmacy connected with Dental Surgery," by S. S. FITCH, M. D. This was the largest and most comprehensive treatise that had as yet appeared in this country. In fact, I think I hazard nothing in saying, that no work of equal value, had, at this time, been published in any country. In 1835, a second and improved edition of the same work was published, and this, as well as the first, is now exhausted.

"Dentologia, a poem," by Dr. SOLYMON BROWN, with Notes by Dr. E. PARMLY, is the title of a small volume, published in 1833. This most curious and singular production has been extensively read and much admired. Dr. S. Brown is also the author of another poem, entitled "Dental Hygeia," and a treatise on Mechanical Dentistry. The first of these was published in 1838, and the other subsequently, in the American Journal of Dental Science. Dr. Brown is an accomplished writer, and has contributed many other interesting papers to the pages of that periodical, and for three years was one of its editors, and would have been re-elected, had he not retired from the active duties of the profession, and in consequence, declined to be a candidate for it.

A year after the publication of the second edition of Dr. Fitch's System of Dental Surgery, a very excellent and valuable popular treatise, entitled "Guide to Sound Teeth," by S. SPOONER, M. D.,

was issued from the press, "The Anatomy, Physiology and Diseases of the Teeth and Gums," &c. &c., by Paul Beck Goddard, M. D., is the title of a quarto volume published in 1843.

Besides the foregoing, a number of other works on the subject have been published in the United States, and the periodical, already several times alluded to, and which has reached the middle of the fifth volume, contains many valuable, instructive, and highly interesting contributions, from various gentlemen of the profession in the United States, whose names it is not necessary here to mention. A number of able papers are also contained in some of the Medical Journals of this country, but to these the author will not refer on the present occasion.

In mentioning the foregoing works, the productions of American writers, it has formed no part of the design of the author to enter into an analysis of their merits,—his object having been merely to show, that the literature of the Dental branch of medicine, had made some progress in this country as well as in Europe. Nor in doing this, has it been his intention to institute a comparison between the relative merits of the practice (in this department of Surgery,) of the two countries. Although national characteristics may, to some extent, modify all medical and Surgical practice, and give it peculiarities as distinctly marked as national literature, customs and manners, it is, after all, a cosmopolite, acknowledging no boundaries of clime or country.

So rapid has been the growth of Dental Surgery in the United States during the last fifteen or twenty years, that now, every city, and almost every town of from two to five thousand inhabitants, can boast of from one to twenty or more scientific, skilful practitioners. But while scientific Dentistry has thus rapidly progressed, empiricism has not been idle, and it would be impossible to form any accurate estimate of the amount of injury daily inflicted, by the hundreds of quacks with which the country abounds.

But I will not enlarge upon this part of my subject. Let it suffice to say, that Dental Surgery as at present practiced by the scientific of the profession every where, unites the *Utile Dulci*, and claims its usefulness to be as prominent as its beauty—its salutary influences upon general health to be as lasting and beneficial as its beauty is striking and impressive.

CHAPTER SECOND.

OF THE IMPORTANCE ATTACHED TO THE HUMAN TEETH, AND CUSTOMS CONCERNING THEM.

IN every age and country, even among the rudest and most barbarous nations, these useful and beautiful organs have attracted attention, and been regarded as being of great importance for the purpose of giving symmetry and beauty to the face.

The most important business of the teeth is the comminution of food. This is a preparatory process indispensable to a quick and easy digestion; and hence, the loss of these organs in brutes is soon followed by death; but in man, it may, to a considerable extent, be repaired; so that, although the teeth are essential to comfort and perfect health, they are not absolutely necessary to human life, notwithstanding the doctrine taught by NICEPHORUS would seem to imply otherwise. They are also essential to the modulation of the voice and to a distinct enunciation of language; and hence, when one or more of them is lost, much inconvenience in articulation is often experienced.

LORD CHESTERFIELD says: "That fine and clean teeth are among the first recommendations to be met with in the common intercourse of society." LAVATER remarks, "That the countenance is the theatre on which the soul exhibits itself," and adds, "as are the teeth of man, so is his taste."

The following beautiful extract is taken from the French Dictionary of Medical Sciences, vol. 8, p. p. 329, 330. "The teeth are the finest ornament of the human countenance. Their *regularity* and *whiteness* constitute its chief attraction. If the mouth exceeds its ordinary size, fine teeth serve to disguise this defect of conformation; and the illusion that results from the perfection of their arrangement, is often such, that we imagine that it would

not have appeared so well even had it been smaller. Observe that lady smile, whose mouth discloses the perfection of their arrangement. You never think of noticing the extent of the diameter of her mouth. All your attention is fixed upon the beauty of her teeth and the gracious smiles that so generously expose them.

“These ornaments are equally attractive in both sexes. They distinguish the elegant, from the slovenly gentleman, and, by softening the features, diffuse amiability over the whole countenance. Even the face of the black African, when he smilingly shows his sparkling teeth, ceases to frighten the timid beauty.

“Fine teeth are more especially necessary to woman, for it is her destiny, first to gratify our eyes, before she touches our souls and captivates our hearts. The influence that the teeth exercise in the production of beauty, justifies the pre-eminence that I have assigned them, over all the other attractions of the face. Let a woman have fine eyes, a pretty mouth, a handsome nose, a well turned forehead, elegant hair, and a charming complexion, but only let her teeth be bad, blackened by caries, or covered with thick tartar or viscid conerctions, let her, in a word, exhale a contaminated breath, and the moment she opens her mouth, she will cease to be thought beautiful. If she, on the contrary, has small eyes, or a large nose, and is even positively ugly, yet if her teeth are regularly planted, white, and above all, entire, (or at least those of them that are visible,) she, however frightful she may be, will appear agreeable the moment a smile comes to her aid, and will hear those words whispered around her that are so consoling to her vanity, ‘Ah, what beautiful teeth she possesses.’

“Whenever nature, that is sometimes sparing of her gifts, has failed to bestow them on the teeth, and has made them defective in form, and tarnished in color, great care and cleanliness should be used in order to hide these imperfections and faults. For then, if the teeth do not attract our regard, they will not, at least, affect us with disgust.”

Lavater, the learned physiognomist, regarded the shape, size, and arrangement of the teeth, as indices to the qualities and disposition of the mind, as well as to the physical powers of the body. “White, clean, and well arranged teeth, visible as soon

as the mouth opens, but not projecting, nor always entirely seen, I have never met with," says he, "except in good, acute, honest, candid, and faithful men." Again he remarks: That short, broad teeth, standing close to each other, show tranquil, firm strength; and, that melancholy persons seldom have well arranged, clean, and white teeth.

He proceeds in this manner to assign qualities to the body and mind, according to the shape, appearance, and position of the teeth. To support his theory, he even goes to the brute creation, and, taking the river horse as an example, remarks: "How stupidly savage and inexorable, how irregular are the position and figure of the teeth. How peculiar the character of satanic, but foolish, self-destructive malignity."

Lavater may have been a good physiognomist, but he certainly must have been ignorant of the physiology of the formation and growth of the human teeth, or he never would have regarded them as indicating the qualities either of the body or mind; for the physical structure and appearance of these organs, are so much influenced by the condition of the system at the time of their production, that persons of directly opposite characters frequently have teeth entirely alike.

How much soever there may be in the face to indicate the character of the mind, and the powers of the body, there is certainly nothing of the kind in the teeth; for good and bad teeth are alike common to the most hardy, robust, and athletic, and to the weakest and most effeminate—to those of the highest grade of intellect, and the simplest idiots—to persons of the strongest and most ungovernable passions, and to those of the mildest and most amiable dispositions.

Regular, well formed, and white teeth, were, by the ancients, considered as characteristics of beauty, as may be seen from the following extracts: Jacob, in blessing Judah, says, "His teeth shall be white with milk." Solomon, in describing the church of God, compares it to a beautiful woman; and, after setting forth her graces in such language as immediately brings to the mind's eye, her whom Milton has described as being the fairest of her daughters, uses the following simile: "Her teeth are like a flock of sheep that are even shorn, which came up from the washing

whereof, every one bear twins." The Hebrews considered the loss of these organs as a grievous and somewhat disgraceful circumstance. Thus David uses this emphatic language: "O God, thou hast smitten all mine enemies on the cheek bone; thou hast broken out the teeth of the ungodly." Again, he prays thus against the wicked judges, "Break out their teeth, O God, in their mouth." Many such passages may be met with in the book of inspiration, but we have quoted enough to show, that even in these very early days, much importance was attached to the teeth.

MR. JOSEPH MURPHY, in his *Natural History of the Human Teeth*, informs us, that "the natives of Hindostan, the Bramins in particular, are extremely delicate in every point relating to their teeth. Every morning, when they rise, they rub them for upwards of an hour with a twig of a racemiferous fig tree, at the same time addressing their prayers to the sun, and calling down the blessings of heaven on themselves and their families. As this practice is prescribed in their most ancient books of law and divinity, we imagine it coeval with the date of their religion and government. It exhibits a curious proof of the regard which this polished and scientific people had for the purity and beauty of the mouth, when so simple a practice is inculcated as a law, and rendered indispensable as a religious duty."

The Bramins are said to have finer teeth than any other people in the world. This is, without doubt, in a great measure, to be attributed to the attention that they pay to their cleanliness. These people, also, separate their teeth with a file, as soon as the second set is perfectly formed, but we cannot determine whether this be for the purpose of preventing decay, or of adding to their beauty.

There is a variety of customs among many of the inhabitants of India and the islands of the Pacific, which show the importance these people attach to their teeth.

The inhabitants of Tonquin and Siam, dye their teeth black, as also do the females of the Marian islands, and the unmarried ladies of Java.

Many of the women of Sumatra have their teeth filed down to their gums; others again, either have them filed down to points, or the enamel extremities filed off, in order that they may the more

easily be dyed black; which color is regarded as being very ornamental. The great men of these islands color their upper teeth black, and encase their lower ones in gold, which is said to make a beautiful contrast by candle light. The inhabitants of some of the other East India islands, gild their two front teeth, and dye the others black.

The natives of Malacca grind horizontal grooves across the surface of their upper incisors. The Abyssynian negroes file their teeth to points, and thus increase the savageness of their aspect.

In India, white teeth were formerly considered as ornamental to the face, as may be seen from the writings of their poets. "The lover," says Mr. Murphy, "in enumerating the charms of his mistress, never fails to notice, as a principal attraction, the whiteness and regularity of her teeth."

CATULLUS, in describing the beauty of Panthea, alludes to her white, even, and well arranged teeth, and compares them to a sparkling necklace of the most beautiful and brilliant pearls.

IVID also seems to have thought that white teeth were very attractive; for, in addressing a beautiful lady, he remarks: "I can perceive your attention to the graces by the whiteness of your teeth."

The inhabitants of Prince William's Sound, we are informed by Mr. Murphy, "make an incision in the upper lip, parallel with the mouth, sufficiently large to admit the tongue through. When the sides of the incision are healed, they have much the appearance of lips. In this artificial mouth they wear a shell, which is cut to resemble a row of teeth."

The natives of the Sandwich Islands, in order to propitiate their god, Eatooa, offer up to him their front teeth, thus indicating the estimation in which they hold them.

We shall make no apology for thus dilating on this point, since, whatever relates in any way to the teeth, ought not to be uninteresting and uninteresting to the student of Dentistry.

PART FIRST.

ANATOMY AND PHYSIOLOGY OF THE MOUTH.

EFFECTS THAT SOMETIMES RESULT FROM FIRST DENTITION.

IMPORTANCE OF THE PRESERVATION OF THE TEMPORARY
TEETH.

MANAGEMENT OF SECOND DENTITION;

AND TREATMENT OF IRREGULARITY OF THE TEETH.

PART FIRST.

ANATOMY AND PHYSIOLOGY OF THE MOUTH.

THE MOUTH, containing the Dental Apparatus, is a very complicated piece of mechanism—forms an essential part of the human frame—has the widest possible range of sympathy—contains a great variety of organs—and performs an equally great variety of functions.

ELEMENTS OF THE MOUTH.

The anatomical elements composing the mouth consist of Bone, Ligament, Muscle, Gland, Vessel, Nerve, Cellular, and Adipose Tissue, Mucus Membrane, &c. &c.

These different elements combine together and form the various organs which constitute the mouth.

These organs I shall consider in their physiological order—thus combining their anatomy and physiology—or studying at the same time both their healthy structure and function—a plan practically taught by Professor W. R. Handy in the Baltimore College of Dental Surgery, and which commends itself by being the most natural, interesting and instructive.

The mouth (os) or its cavity is bounded above by the palatine processes of the superior maxillary and palate bones—below by the tongue and mylo-hyoid muscles—laterally by the cheeks—anteriorly by the lips—and posteriorly by the soft palate.

The mouth is concerned in the four primary stages of Digestion, namely:

Prehension, Mastication, Insalivation and Deglutition—besides being engaged in the intellectual acts of speech and expression.

CHAPTER FIRST.

ORGANS OF PREHENSION.

FIG. 1.



This class of organs may be said to commence Digestion, and comprise those which seize the food, introduce, and partly retain it in the mouth.

They consist of the Elevators, Depressors, and Sphinctor muscles of the mouth, which are as follow:

1. Levator Labii superioris alæque nasi.

2. Levator anguli oris.

These two elevate the upper lip and angle of the mouth.

3. Depressor Labii inferioris—or quadratis menti.

4. Depressor anguli oris—or triangularis oris.

These two antagonize the first and depress the lower lip and angles of the mouth.

5. Zygomaticus major.

6. Zygomaticus minor.

7. Buccinator.

These are situated to the outside of the angles of the mouth—in the direction from the angles to the prominence of the cheek.

FIG. 1. A front view of the muscles of the face: *a a* Anterior bellies occipito-frontalis; *b b* Orbicularis palpebrarum; *c* Pyramidalis nasi; *d* Compressor nasi; *e e* and *f f* Levator labii superioris alæque nasi; *g g* Zygomaticus minor; *h h* Zygomaticus major; *i i* Masseter muscle; *j j* Buccinator, or Trumpeters muscle; *k k* Orbicularis oris; *l l* Depressor labii inferioris; *m* Levator menti; *n n* Depressor anguli oris; *o o* Levator anguli oris.

Their use is to draw the angles of the mouth upwards and outwards towards the ear.

8. *Orbicularis oris.*

This is the sphinctor musele which surrounds and closes the mouth.

9. *Depressor Labii superioris.*

10. *Levator Labii inferioris.*

The one depresses the upper lip against the teeth—the other raises the lower lip.

ORIGIN AND INSERTION OF THESE MUSCLES OR THEIR ATTACHMENTS.

1. *Levator Labii Superioris Alæque Nasi*, arises by two heads—first, from the nasal process of the superior maxillary bone—second, from the edge of the orbit above the infra orbital foramen. It is inserted into the alæ nasi or wing of the nose and upper lip.

2. *Levator Anguli Oris*, arises from the canine fossa of the superior maxillary bone, immediately below the infra orbital hole. It is inserted narrow into the angle of the mouth.

3. *Depressor Labii Inferioris*, arises from the side and front of the inferior maxilla at its base, and is inserted into the greater part of the lower lip.

4. *Depressor Anguli Oris*, arises broad and fleshy from the base of the lower jaw at the side of the chin. It is inserted into the angle of the mouth.

5. *Zygomaticus Major*, arises long and narrow from the malar bone, near the Zygomatic suture. It is inserted into the angle of the mouth.

6. *Zygomaticus Minor*, arises from the front part of the malar bone, and is inserted into the upper lip, above the angle of the mouth.

This musele is sometimes wanting—and is sometimes a simple slip from other museles.

7. *Buccinator*, arises from the upper and lower jaws as far back as the coronoid and pterygoid processes, and from the alveolar ridge as far forwards as the bicuspid teeth. It is inserted into the angle of the mouth.

8. *Orbicularis Oris*. This muscle has no bony attachments—it is circular, surrounds the mouth—and consists of two planes of fibres, one for the upper—the other for the lower lip, which meet at the angle of the mouth.

9. *Depressor Labii Superioris*, arises from the alveolar processes of the incisor and canine teeth; and is inserted into the upper lip and side of the alæ nasi.

10. *Levator Labii Inferioris*, arises from the alveolar processes of the incisor teeth of the lower jaw. It is inserted into the lower lip and chin.

See organs of mastication for description of bones concerned with these muscles.

CHAPTER SECOND.

ORGANS OF MASTICATION.

MASTICATION, as the term implies, is a process of chewing or reducing the food when introduced into the mouth, into minute portions, and the organs under this head are the agents or instruments which effect this operation.

The organs of mastication are divided into,

- 1st. The passive.
- 2d. The active.

PASSIVE ORGANS OF MASTICATION.

The passive includes the bones, ligaments and teeth.

The principal bones are,

1. The superior maxillary or upper jaw bones.
2. The inferior maxillary or lower jaw bone.
3. Palate bones.

THE SUPERIOR MAXILLARY BONES.

FIG. 2.

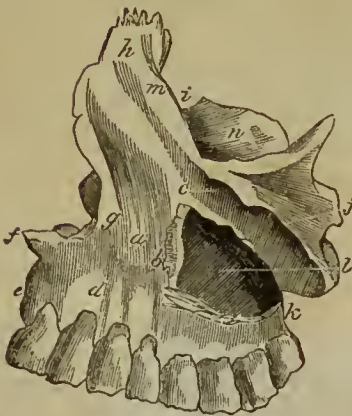


FIG. 3.



FIG. 2. *a* The body of the left superior maxillary; *b* Canine fossa; *c* Infra orbital foramen; *d* Incisive fossa; *e* Harmonial suture of the two bones; *f* Nasal spine;

The Superior Maxillary Bones, being two in number, are in pairs and united on the median line of the face. They occupy the anterior upper part of the face, are of very irregular form, and consist of a body, processes and foramina.

The body is the central part of the bone and has four surfaces, namely, the anterior or facial surface, the posterior or pterygoid, the superior or orbital, and the inferior or palatine surface.

The Anterior Surface is irregularly convex, and has a depression about its centre just above the canine and first bicuspid teeth, called the canine fossa—immediately above which is the infra orbital foramen for transmitting an artery and nerve of same name—its upper and inner edge forms part of the lower margin of the orbit—from the inner extremity of which proceeds upwards towards the nasal and frontal bones a long and rather flat process, the nasal process of the superior maxilla—it is of a pyramidal form; its posterior edge forming the internal margin of the orbit and helping to make the lachrymal groove,—its anterior edge receives the cartilages of the nose—its upper corresponds to the nasal bones, and its summit to the frontal, while its outer surface gives attachment to muscles, and its inner enters into the formation of the nose.

From the lower edge of its *anterior surface*, the alveolar processes and cavities are formed—these consist in depressions of a more or less conical form and correspond to the number of teeth, or roots of teeth, they are intended to receive.

The Posterior Surface has a bulging called tuberosity, which is connected to the palate bones, and bounds behind the antrum—is perforated by three or four small holes—the posterior Dental canals which go to the alveoli of the molar teeth.

g Semilunar notch of anterior nares; *h* Nasal process; *i* Articulation of lachrymal bone; *j* Malar process; *k* Tuberosity of superior maxillary; *l* Cavity of the antrum; *m* Lachrymal tubercle; *n* Orbital process.

FIG. 3. *a* Nasal surface of left superior maxillary; *b* Opening of antrum; *c* Inferior turbinated bone; *d* Inferior meatus of nose into which the nasal duct opens; *e* Nasal process; *f* Semilunar notch of lachrymal bone; *g* Nasal spine; *h* Palate process; *i* Alveolar processes; *j* Palate process of palate bone; *k* Palate spine; *l* Tuberosity of palate bone; *m* Hamular process.

The *Lower Surface* extends from the alveolar processes in front to the horizontal plate of the palate bones behind, called the palatine processes, which are rough below, forming the roof of the mouth, and smooth above, making the floor of the nostrils. They are united along the median line, at the anterior part of which is the foramen incisivum, having two openings in the nares above, while there is but one in the mouth below.

The *Upper or Orbital Surface* is triangular in shape, with its base in front forming the anterior, lower and internal edge of the orbit—while its apex extends back to the bottom, it forms the floor of the orbit and roof of the antrum—its internal edge is united to the lacrymal, ethmoid, and palate bones—its external edge assists in forming the sphenomaxillary fissure, and along its central surface is seen a canal running from behind, forwards and inwards, the infra-orbital canal. This canal divides into two, the smaller is the *anterior dental*, which descends to the anterior alveoli along the front wall of the antrum—the other is the proper continuation of the canal and ends at the infra-orbital hole—along the upper part of the line uniting the palatine processes there is a ridge, the *nasal crest* for receiving the vomer, and at the anterior part of this crest there is a projection forwards, the *nasal spine*—at the external and upper part of the body is a *malar process*.

The body of the superior maxilla is occupied by a large and very important cavity called the *Antrum Highmoreanum* or *Maxillary Sinus*. This cavity is somewhat triangular in shape, with its base looking to the nose, and its apex to the malar process. Its upper wall is formed by the floor of the orbit, its lower by the alveoli of the molar teeth which sometimes perforate this cavity. The canine fossa bounds it in front, while the tuberosity closes it behind.

The opening of this cavity is on its nasal portion or base into the middle meatus of the nose, and in the skeleton is large, while in the natural state it is much contracted by the ethmoid bone above, the inferior spongy bone below, the palate bone behind and by the mucous membrane which passes through this opening and lines the antrum.

This cavity communicates with the anterior ethmoidal cells and frontal sinus.

The structure of the upper jaw is thick and cellular in its alveolar and other processes.

It is articulated with two bones of the cranium, the frontal and ethmoid, and seven of the face, namely: the nasal, malar, lachrymal, palate, inferior spongy, vomer, to its fellow and also to the teeth.

Its development is very complicated, and is stated to be by as many osseous points as that of the body and its various processes.

INFERIOR MAXILLARY BONE.

FIG. 4.



The *Lower Jaw*, Fig. 4, is the largest bone of the face—and though but one bone in the adult, consists of two symmetrical peices in the foetus.

It occupies the lower part of the face—has a semicircular form, and extends back to the base of the skull.

It is divided into the body and extremities.

The body is the middle and horizontal portion—this is divided along its centre by a ridge called the *symphysis*—which is the place

FIG. 4. The inferior maxillary: *a* Body of the bone; *b* Mental foramen; *c* The symphysis; *d d* Alveolar proecesses; *e* Ramus of the lower jaw; *f* Its angles; *g g* Coronoid proecesses; *h h* Sigmoid noteh; *i i* Condyloid processes; *j j* Neck of the condyles; *k* Inferior dental foramen; *l* Mylo-hyoidean ridge.

of separation in the infant state—the middle portion projects at its inferior part into an eminence called the *mental process* or chin—on each side of which is a depression for the muscles of the lower lip, and externally to these depressions are two foramina, called *anterior mental*, for transmitting an artery and nerve of the same name.

The horizontal portion or sides extends backwards and outwards—and on the outer surface have an oblique line for the attachment of muscles.

On the inner surface of the middle part behind the chin, along the line of the symphysis, there is a chain of eminences called *genial processes*—to the superior of which the frenum linguæ is attached, to the middle the genio-hyo-glossi, and to the inferior the genio-hyoid muscles—on each side of these eminences are depressions for the sublingual glands—and on each side of these depressions there runs an oblique ridge upwards and outwards, to the anterior part of which is attached the mylo-hyoid muscle, and to the posterior part, the superior constrictor of the pharynx—this latter muscle is consequently involved more or less in the extraction of the last molar tooth. Below this line there is a groove for the mylo-hyoid nerve.

The upper edge of the body is surmounted by the *alveolar processes* and cavities—corresponding in number and size to the roots of the teeth.

The lower edge called the base is rounded, obtuse and receives the superficial facia and platysma muscle.

The extremities of the body have two large processes rising up at an obtuse angle named the *rami* of the lower jaw. These processes are flat and broad on their surfaces, the outer is covered by the masseter muscle—the inner has a deep groove which leads to a large hole, the *posterior dental* or maxillary foramen for transmitting the inferior dental nerves and vessels to the dental canal running along the roots of the teeth. This foramen is protected by a spine to which the internal lateral ligament is attached.

The ramus has a projection at its lower part which is the angle of the lower jaw—its upper ridge is curved, having a process at each end—the anterior one is the *Coronoid process*; this is triangular, and has the temporal muscle inserted into it—the posterior

is the *Condyloid* and articulates with the temporal bone. This process has a neck for the insertion of the external pterygoid muscle.

The structure of the inferior maxilla is compact externally, cellular within and traversed in the greater part of its extent by the inferior dental canal.

The lower jaw is developed by two centres of ossification, which meet at the symphysis. It is articulated to the temporal bones by the condyles, and several ligaments, to wit: external and internal lateral, the capsular, inter-maxillary, stylo-maxillary, and two synovial membranes—the external one of which is seen on Fig. 19. It is also articulated with the teeth.

THE PALATE BONES.

The palate bones, two in number and in pairs, are situated at the back part of the superior maxillary bone, between its tuberosities and the pterygoid processes of the sphenoid bone.

FIG. 5.



FIG. 6.



FIG. 5. Posterior view of palate bone in its natural position, except that it is turned a little to one side so as to show the internal surface of its perpendicular plate: *a* Nasal surface of horizontal plate; *b* Nasal surface of perpendicular plate; *c k l* Pterygoid process or tuberosity; *d* Broad internal border of horizontal plate which it articulates with same border of opposite bone; *f* Process which with same one of opposite bone of the other bone forms the nasal spine; *g* Horizontal ridge which gives attachment to inferior turbinated bone; *h* Spheno-palatine foramen; *i* Orbital portion; *j* Pterygoid apophysis.

FIG. 6. Spheno-maxillary surface of perpendicular plate of palate bone: *a* Its rough surface, or the one which articulates with superior maxillary bone; *b* Part of the posterior palatine canal; *c* Spheno-palatine foramen; *d* Spheno-maxillary facet; *e* Orbital facet; *f* Maxillary facet; *g* Sphenoidal portion of perpendicular plate; *h* Tuberosity of the base or pterygoid process.

The palate bone is divided into three plates—the horizontal or palate, the vertical or nasal, and the orbital.

The palate plate is broad and on the same line with the palate processes of the superior maxillary bone—its upper surface is smooth, and forms the posterior floor of the nostrils—the lower surface is rough, and forms the posterior part of the roof of the mouth—its anterior edge is connected to the palate process of the upper jaw, and its posterior is thin and crescentic to which is attached the *velum pendulum palati* or soft palate—at the posterior point of the suture uniting the two palate bones there projects backwards a process called the *posterior nasal spine*, which gives origin to the *azygos-uvulæ* muscle. The *vertical plate* ascends, helps to form the nose, diminishes the opening into the antrum by projecting forward, and by its external posterior part in conjunction with the pterygoid processes of the sphenoid bone forms the *posterior palatine canal*—the lower orifice of which is seen on the margin of the palate plate, and called the *posterior palatine foramen* which transmits the palatine nerve and artery to the soft palate; behind this foramen is often seen a smaller one passing through the base of the pterygoid process of this bone, and sending a filament of the same nerve to the palate.

The upper end of the vertical or nasal plate has two processes—the one is seen at the back of the orbit and called the *orbital* process, the other is posterior and fits to the under surface of the body of the sphenoid bone. Between these two processes there is a foramen, the *spheno palatine*, which transmits to the nose a nerve and artery of the same name.

The palate bone articulates with six others, namely: the superior maxillary, inferior turbinated, vomer, sphenoid and ethmoid.

The structure of this bone is very thin, and consists almost entirely of compact tissue. Its development, it is said, takes place by a single point of ossification at the place of the union of the vertical, horizontal and pyramidal portions.

These bones are all more or less related with the bones of the head—of which eight compose the cranium and fourteen the face. Those of the cranium are, one frontal, two parietal, two temporal, one occipital, one sphenoid and one ethmoid. Those of the face

are six pairs and two single bones—the pairs are, to wit: the two malar, two superior maxillary, two lachrymal, two nasal, two palatine and two inferior spongy. The vomer and inferior maxillary are the two single bones.

THE TEETH.

The teeth are the prime organs of mastication—are the hardest portions of the body, and occupy the alveolar cavities of both the upper and lower jaw.

They have two grand divisions, to wit:

1. The milk, temporary or deciduous teeth.
2. The permanent or adult teeth.

Each division consists of three classes,

1. Incisors; 2. Cuspidati; 3. Molares, and one class peculiar to the permanent, namely, the Bicuspides.

The deciduous teeth are twenty in number, ten in each jaw, to wit: four incisores, two cuspidati, and four molares.

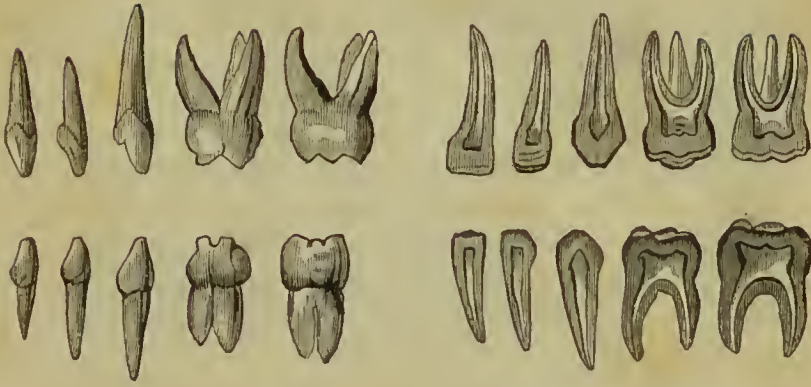


FIG. 7. Front view of the temporary teeth.

FIG. 8. Back and inner view of temporary teeth.

FIG. 9.

FIG. 10.



The pulp cavities of the temporary teeth are larger in proportion to their size than are those of the permanent teeth.

The permanent set have thirty-two teeth, sixteen to each jaw—having an increase of twelve in the adult mouth, and designated as follows: incisors, four; cuspidati, two; biseuspides, four; molares, six to each jaw. The third or last molaris is sometimes designated by the name *dens sapientiæ* or wisdom tooth.

A tooth consists of a body or crown, a root or fang, and a middle portion or the neck—the body is the exposed part above the gum; the root occupies the alveolar cavity or socket; while the neck is the contracted portion between the body and root.

The *structure* of the teeth is composed of three distinct parts, to wit: 1. the pulp; 2. the bone or ivory, and 3. the *enamel*—to which is added a fourth part, the *crusta petrosa*, or cementum.—(See Fig. 11.)

FIG. 9. Lateral or side view of the temporary teeth.

FIG. 10. Temporary teeth split so as to expose their pulp cavities.

FIG. 11.



The *pulp* forms the rudiment or germ of the future tooth, which Mr. Thos. Bell describes as “very soft, gelatinous, and semi-transparent,” that its surface is covered by “an extremely delicate, thin, vascular membrane, closely attached to it by vessels.”

This membrane he calls “the proper membrane of the pulp.” The pulp, (*a* Fig. 11) is enclosed in a sac, which consist of two lamina, an outer and inner—the outer is described by Mr. Hunter as soft and spongy, and without vessels, while the inner is extremely vascular and firm. Mr. Bell, on the other hand, contends that the outer is full of vessels, and the inner is destitute and more tender and delicate.

The truth seems to be that both membranes are vascular, as the injections of Mr. Fox, and the preparations of Mr. Bell demonstrate.

The *microscopic observations* of Mr. Nasmyth, whose long and patient attention to this subject commands and deserves the highest regard, says: “On examining the internal structure of the pulp, generally, the number of minute cells presenting themselves in a vesicular form is very remarkable, they seem to constitute indeed the principal portion of its bulk. These vesicles vary in size from the smallest perceptible microscopic appearance, probably the ten thousandth part of an inch in diameter to one eighth of an inch, and are evidently disposed in different layers throughout the body of the pulp. When these layers of macerated pulp are examined, they present an irregular reticular appearance, and are found to be interspersed with granules. The parenchyma is traversed by vessels of which the direction is generally vertical.”

The *bone* (*b* Fig. 11) is a very hard and dense structure, forming the greater part of the tooth, and constituting the whole of the root and centre of the crown and body. It consists of an earthy and an animal portion—the former may be removed by the appli-

FIG. 11. *a* The pulp; *b* The bone; *c* The enamel; *d* The cementum, or crusta petrosa.

cation of an acid, leaving the animal part entirely separate—and applying heat destroys the animal, showing the earthy.

The bone is seen to consist of concentric layers, arranged parallel to the surface of the tooth, and contains the cavity for lodging the pulp.

FIG. 12.



FIG. 13.

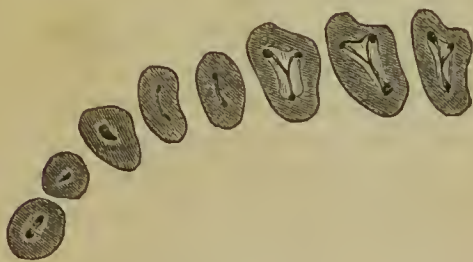


FIG. 14.



FIG. 12. Vertical section of the permanent teeth, showing their pulp cavities and canals through their roots.

FIGS. 13 and 14. View of the pulp cavities of the permanent teeth of both jaws, as presented with their crowns cut off at the necks.

The bone of the tooth is also vascular, as has been clearly demonstrated by specimens in possession of the author, in which vessels in the substance of the bone, charged with red blood, are distinctly traced. Dr. Goddard supposes that all appearances of vascularity of dental bone are deceptive, but in the specimens just alluded to, the fact is too clear to admit of doubt. Similar specimens are in possession of Dr. Maynard, of Washington City.

The chemical analysis of the teeth by BERZELIUS furnishes the following constituents in every 100 parts, to wit:

Phosphate of Lime,	62.
Fluate of Lime,	2.
Carbonate of Lime,	5.5
Phosphate of Magnesia,	1.
Soda and Muriate of Soda,	1.5
Gelatine and Water,	28.
	<hr/>
	100.
	<hr/>

The relative proportions of earthy and animal matter are not always the same.

The Microscope of Mr. NASMYTH demonstrates the bone of the tooth to be essentially *cellular* in its structure.

The fibres of the tooth are found to be interspersed and made up of different compartments, the shape and size of which vary in different animals; in the human tooth being oval, and these compartments or cells having their long axis corresponding with the course of the fibre, and the extremity of each in opposition to the one adjoining.

The cells constitute the frame-work, in which the ossific matter is deposited, and thus become the fibres of the bone or ivory part of the tooth.

The *Enamel* (c Fig. 11) covers the crown, and extends to the neck of the tooth. It is considered the hardest of all animal substances, is generally of a pearly, milk white colour, and extremely smooth and polished on its surface. Like the bone of the tooth, it varies in density, being much harder on some teeth than others;

it is thickest on those parts of the teeth most exposed to friction as on the eminences of the molares, the cutting edges of the incisors, and the points of the bicuspidates and cuspidati—and is thinnest towards the alveoli. The structure of the enamel is *fibrous*, having its fibres radiating from the centre to the surface of the tooth—by which arrangement immense strength and the power of sustaining great pressure is secured.

It consists, like the bone, of animal and earthy matter—the animal being less.

The chemical composition by BERZELIUS in every 100 parts of enamel is, to wit:

Phosphate of Lime,	.	.	.	.	85.3
Fluate of Lime,	.	.	.	.	3.2
Carbonate of Lime,	.	.	.	.	8.
Phosphate of Magnesia,	.	.	.	.	1.5
Soda and Muriate of Soda,	.	.	.	.	1.
Animal Matter and Water,	.	.	.	.	1.
					<hr/>
					100.
					<hr/>

These proportions, however, are not always the same. They vary in the enamel of the teeth of different individuals.

The Microscopical observations of Mr. NASMYTH also show that the enamel is made up of cells, and thus demonstrate an identity of character, namely: the cellular, as belonging to the three distinct elements entering into the composition of every tooth, to wit: the pulp, bone and enamel.

Crusta Petrosa or Cementum (d Fig. 11) covers the fang or root, and has been traced over the enamel.

DESCRIPTION OF TEETH BELONGING TO EACH CLASS.

Each tooth as has already been remarked, has a body or crown, neck and root.

The *Incisors* (four to each jaw, Fig. 15, *a a, a a*) occupy the anterior central part of each maxillary arch. The body of each is wedgeshape—the anterior surface is convex and smooth—

the posterior is concave, and presents a tubercle near the neck; the two surfaces come together, and form a cutting edge. In a front view the edge is the widest part, diminishes towards the neck, and continues narrowing to the extremity of the root.

FIG. 15.



The roots are all single, of a conical form, flattened laterly, and slightly furrowed longitudinally. The enamel is thicker before than behind, and behind than at the sides.

The incisors of the upper jaw are stronger and larger than those of the lower jaw. The central incisor of the upper jaw is about one-third larger than the lateral of the same. The lateral incisor of the lower jaw is generally rather wider than the central, though the difference in the size of these teeth is never so great as to be very perceptible.

The function of this class of teeth, as their name imports, is to cut the food.

The *Cuspidati* or *Canini* (Fig. 16) are situated next to the incisors, and are two to each jaw—one on either side. They some-

FIG. 15. *a a*, *a a* Front view of the incisors; *b b*, *b b* Back view; *c c*, *c c* Side or lateral view.

what resemble the upper central incisors with their angles rounded. Their crowns are conical, very convex externally, and their posterior surface more uneven and having a larger tubercle than the incisors. Their roots are also larger and the longest of all the teeth—and like the incisors, are also single, but have a groove extending from the neck to the extremity, showing a step at forming two roots.

The enamel is thicker and denser on the cuspidati than on the incisors.

The upper cuspidati are the largest, and called the eye-teeth; the lower are termed the stomach teeth.

These are for tearing the food, and in some of the carnivorous animals, where they are very large, not only rend but also hold their prey.

The Bicuspidates, (Fig. 17,) four to each jaw, are next in order to the cuspidati, and are two on either side, are so called from their having two distinct prominences on their friction surfaces. They are also named the small molares. They are thicker from their anterior to their posterior surface than either the incisors or

FIG. 16.

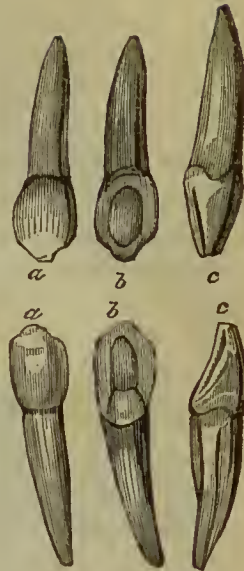


FIG. 17.



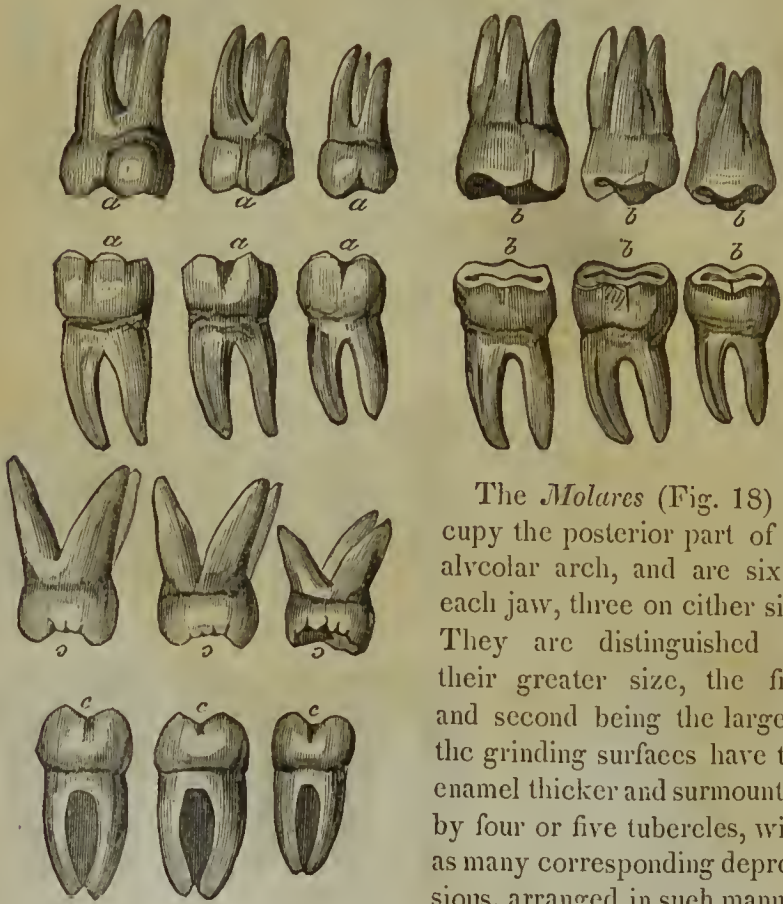
FIG. 16. *a a* Front view of the cuspidati; *b b* Back view; *c c* Side view.

FIG. 17. *a a, a a* Exterior view of the bicuspidates; *b b, b b* Inner view; *c c, c c* Side view.

cuspidati, and are flatter on their sides. The grinding surface of each is surmounted by two conical tubercles, separated by a groove running in the direction of the alveolar arch; the outer is larger and more prominent than the inner. In the lower jaw these tubercles are smaller than in the upper.

The roots of the bicuspides are generally simple, though the groove is deeper than in the cuspidati, and not unfrequently terminates in two roots, which have each an opening for the vessels and nerves to enter.

FIG. 18.



The *Molares* (Fig. 18) occupy the posterior part of the alveolar arch, and are six to each jaw, three on either side. They are distinguished by their greater size, the first and second being the largest, the grinding surfaces have the enamel thicker and surmounted by four or five tubercles, with as many corresponding depressions, arranged in such manner

FIG. 18. *a a a, a a a* Outer view of the molares; *b b b, b b b* Inner view; *c c c, c c c* Side view.

that the tubercles of the upper jaw are adapted to the depressions of the lower, and vice versa.

The upper molares have three roots, sometimes four, and as many as five are occasionally seen—of these roots two are situated exteriorly, almost parallel with each other and perpendicular; the third root is at an acute angle, and looks to the roof of the mouth.

The lower molares have but two roots, the one anterior, the other posterior, are nearly vertical and parallel with each other, and much flattened laterally. The roots of the two first superior molares correspond with the floor of the maxillary sinuses, and sometimes protrude in this cavity—and their divergence secures them more firmly in their sockets.

The last molar, called the *Dens Sapientiae* or wisdom tooth, is both shorter and smaller than the others, the roots of the upper wisdom tooth are occasionally united so as to form but one—while the last molar of the lower jaw is generally single and of a conical form.

The use of the molares, as their term signifies, is to triturate or grind the food during mastication.

ARTICULATION OF THE TEETH.

The manner in which the teeth are confined in their sockets is by a union called *gomphosis*, from the resemblance of this kind of articulation to the way in which a nail is received into a board. Those teeth having but one root, and those with two perpendicular depend greatly on their nice adaptation to their sockets for the strength of their articulation.

Those having three or four roots rely mostly on their divergence for their firmness.

But there is another bond of union by the periostium lining the alveolar cavities and investing the roots of the teeth, also by the blood vessels entering the apices of the roots; and finally by the gums, which will be noticed in another place.

DIFFERENCE BETWEEN THE TEMPORARY AND PERMANENT TEETH.

The temporary and permanent teeth differ in several respects, and on this point I will give Mr. Bell's observations.

"The temporary teeth are, generally speaking, much smaller than the permanent; of a less firm and solid texture, and their characteristic forms and prominences much less strongly marked. The incisors and cuspids of the lower jaw are of the same general form as the adult, though much smaller, the edges are more rounded, and they are not much more than half the length of the latter. The molars of the child on the contrary are considerably larger than the bicuspids which succeed them, and resemble very nearly the permanent molars.

The roots of these teeth, the molars of the child, are similar in number to those of the adult molars, but they are flatter and thinner in proportion, more hollowed on their inner surfaces, and diverge from the neck at a more abrupt angle, forming a sort of arch."

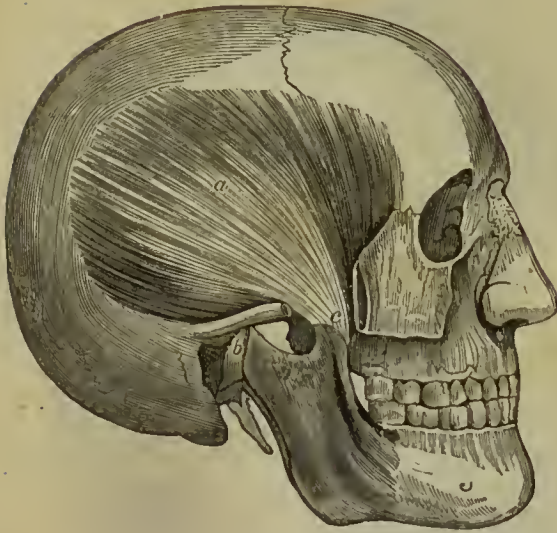
The order and time in which both temporary and permanent teeth appear will be noticed in the chapters on First and Second Dentition.

ACTIVE ORGANS OF MASTICATION.

The active organs of mastication consist of the muscles attached principally to the upper and lower maxillary bones—by these the various motions concerned in mastication are effected.

They are the temporalis, the masseter, pterygoideus externus, and the pterygoideus internus.

FIG. 19.



The *Temporal Muscle* (Fig. 19) is seen on the side of the head, and has its origin from the semicircular ridge commencing at the external angular process of the os-frontis, and extending along this and the parietal bones—also from the surfaces below this ridge formed by the frontal and squamous portion of the temporal and sphenoid bones; likewise from the under surface of the temporal aponeurosis, a strong fascia covering this muscle—and is inserted, after having its fibres to converge and passing under the zygoma, into the coronoid process of the lower jaw, surrounding it on every side by a dense strong tendon.

The office of this muscle is to bring the two jaws together, as in the cutting and rending of the food.

FIG. 19. *a* Side view of the temporal muscle, exposed by the removal of the temporal fascia; *b* External lateral ligament of the lower jaw; *c* Insertion of temporal muscle in coronoid process of lower jaw.

FIG. 20.

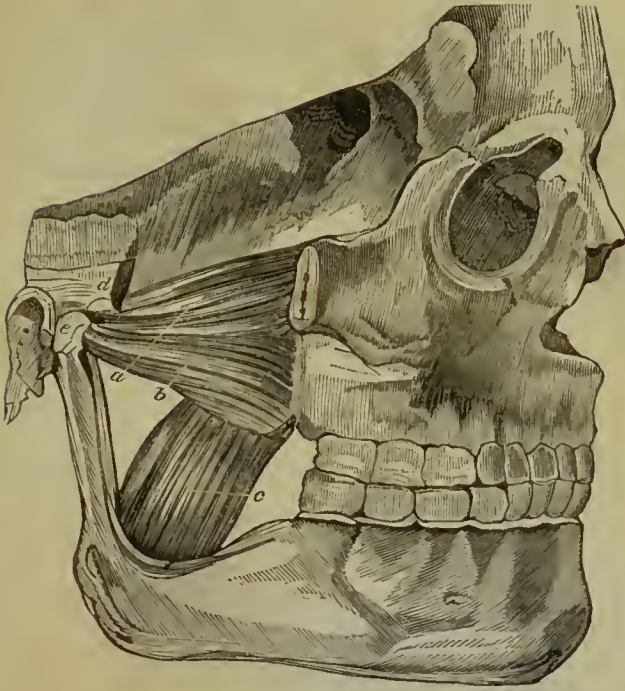


The *Masseter Muscle* (Fig. 20) is seen at the side and back part of the face in front of the meatus externus, and superficial under the skin. It arises by two portions, the one anterior and tendinous from the superior maxilla where it joins the malar bone, the other portions mostly fleshy from the inferior edge of the malar bone and the Zygomatic arch as far back as the glenoid cavity, and is inserted tendinous and fleshy into the external side of ramus of the jaw and its angle as far up as the coronoid process.

The use of this muscle, when both portions act together, is to close the jaws, if the anterior acts alone the jaw is brought forward, if the posterior, it is drawn backward.

FIG. 20. Side view of the muscles of external ear, cranium and face: *a* Occipito-frontalis; *b* Orbicularis palpebrarum; *c* Pyramidalis nasi; *d* Compressor nasi; *e* and *f* Levator labii superioris alæque nasi; *g* Zygomaticus minor; *h* Zygomaticus major; *i* Masseter muscle; *j* Buccinator muscle; *k* Depressor anguli oris; *l* Depressor labii inferioris; *m* Orbicularis oris; *n* Anterior oris; *o* Superior oris; *p* Posterior oris; *q* External lateral ligament; *r* Deep-seated portion of Masseter muscle; *s* Temporal fascia.

FIG. 21.



Pterygoideus Externus (*a* and *b* Fig. 21) arises from the outer surface of the external plate of the pterygoid process of the sphenoid bone, from the tuberosity of the superior maxilla, also from the ridge on the sphenoid bone separating the zygomatic from the pterygoid fossa, and is inserted into the inner side of the neck of the lower jaw.

Pterygoideus Internus arises tendinous and fleshy from the inner surface of the pterygoid plate—fills up the greater part of the pterygoid fossa, and is inserted tendinous and fleshy in the inner face of the angle of the inferior maxilla and capsular ligaments of the articulation.

These two muscles are the great agents in producing the grinding motion of the jaws, and this they do by acting alternately.

FIG. 21. *a* and *b* Superior and inferior portions pterygoideus externus; *c* Pterygoideus internus; *d* Root of zygomatic process; *e* Condyle.

The external one is triangular, having its base at the pterygoid process and running outwards and backwards to the neck of the condyle. When the pair act together, the lower jaw is thrown forwards. The internal is strong and thick, placed on the inside of the ramus of the jaw, and running downwards and backwards to the angle. When it and its fellow act together, the jaw is drawn forwards and closed.

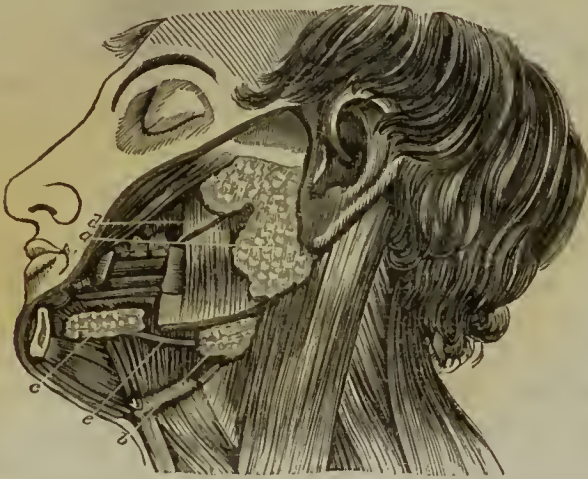
CHAPTER THIRD.

ORGANS OF INSALIVATION.

THE organs of insalivation are the salivary glands, six in number—three on each side of the face, named the *parotid*, *sub-maxillary* and *sub-lingual*.

These glands are the prime organs in furnishing the salivary fluids to the mouth during the process of mastication.

FIG. 22.



The *Parotid Gland*, (*a* Fig. 22,) so called from its situation near the ear, is the largest of the salivary glands. Its form is very irregular; it fills all that space between the ramus of the inferior maxilla and mastoid process of the temporal bone, and as deep back and even behind the styloid process of the same bone. Its

FIG. 22. View of the salivary glands: *a* Parotid gland; *b* Sub-maxillary gland; *c* Sub-lingual glands; *d* Duct of Steno; *e* Duct of Wharton or sub-maxillary duct.

extent of surface is from the zygoma above the angle of the lower jaw below, and from the mastoid process and meatus externus behind to the masseter muscle, in front overlapping its posterior portion.

This gland is one of the conglomerate order, and consists of numerous small granular bodies connected together by cellular tissue, and each of which may be considered a small gland in miniature, as each is supplied with an artery, vein and secretory duct.

The gland thus formed presents on its external surface a pale, flat, and somewhat convex appearance.

It is covered by a dense strong fascia extending from the neck, attached to the meatus externus of the ear, and sends countless processes into every part of the gland separating its lobules, and conducting the vessels through its substance.

The use of this gland is to secrete or separate from the blood the greater part of the saliva furnished the mouth. As the parotid is, however, on the outside and at some little distance from the mouth, it is furnished with a duct to convey its fluid into this cavity—this duct is called the duct of *steno*, or the parotid duct.

It is formed of the excretory ducts of all the granules composing this gland, which successively uniting together, at last form one common duct.

The duct of *steno* commences at the anterior part of the gland, and passes over the masseter muscle, on a line drawn from the lobe of the ear to the middle part of the upper lip, then passes through a quantity of soft adipose matter, and finally enters the mouth by passing through the buccinator muscle and mucus membrane opposite the second molaris of the upper jaw.

The Sub-Maxillary (b Fig. 22,) is the next in size of the salivary glands. It is situated under and along the inferior edge of the body of the lower jaw, and separated from the parotid simply by a process of fascia between the two.

It is of an oval form, pale color, and like the parotid, consists in its structure of small granulations, held together by cellular tissue, and each having a small excretory duct, which successively uniting with one another, finally forms one common duct, to

wit: the duct of Wharton, which passes above the mylo-hyoid musele, and running forwards and inwards enters the mouth below the tip of the tongue at a papilla seen on either side of the fræmun lingua.

The use of this gland is the same as the parotid, to secrete the saliva, and its duet is the route by which it is conducted into the mouth.

The *Sub-lingual Glands*, (c Fig. 22,) are the last of the salivary order, and the smallest in size.

They are situated beneath the anterior and lateral parts of the tongue, covered by the mucus membrane, and resting on the mylo-hyoid musele.

They, like the two glands just described, consist of a granular structure with excretory duets, which, however, do not unite into one common duet, but enter the cavity of the mouth by many duets, whose openings are through the mucus membrane between the tongue and inferior cuspidati and bieuspid teeth.

Their office is the same as the parotid and sub-maxillary.



The *Mucus Glands*, (Fig 23.) Besides the glands furnishing the saliva, there is another series of much smaller size, called the mucus glands. They are simply the little crypts, follicles, or depressions every where found in the mucus membrane of the mouth, and are named according to their situation the glandulæ labialis, glandulæ buccales, &c. &c.

The use of these glands is to furnish the mucus of the mouth, which they pour into this cavity by single orifices opening every where on its surface.

FIG. 23. A view of inner side of the lips, with the mucus membrane removed so as to show the labial and buccal glands: *a a* Ducts of steno; *b b* Labial glands.

CHAPTER FOURTH.

ORGANS OF DEGLUTITION.

THE *Organs of Deglutition* succeed next in the physiological order, and are the last in the series belonging to the mouth as concerned in the primary stages of digestion.

They consist of,

1. The Pharynx,
2. The Soft Palate, and
3. The Tongue.

This class of organs, as the term implies, is concerned in swallowing, or conveying the food, after having undergone the process of mastication, and become properly imbued with the salivary fluids, into the œsophagus, to be thence conducted into the stomach for the after stages of digestion.

The *Pharynx* (Fig. 24) is a large muscular membranous bag, opening in front, and situated behind the mouth, the nares, and soft palate. It is connected above by strong aponeurosis to the cribriform process of the occipital bone, and extends below as far as the fourth or fifth cervical vertebra—behind it is attached to the bodies of the vertebræ, and laterally it is connected to the expanded cornua of the hyoid bone.

By these several attachments, it forms a constant and unoccupied cavity, in which may be seen seven openings leading from it in various directions. The two posterior nares are at the upper and nasal portion; on each side of these, and at the back part of the inferior spongy bones, are the two eustachian tubes leading to the ear. In front and below the velum is the opening into

the mouth, and still lower down the openings for the glottis and the commencement of the œsophagus.

FIG. 24.



The *Muscles of the Pharynx* are three in number, namely:

1. The Superior—constrictor pharyngues superior.
2. The Middle—constrictor pharyngues medius.
3. Inferior constrictors of the pharynx—Cor. phar. inf. Stylo pharyngues.

The constrictors are seen on the posterior part of the pharynx after removing the cervical vertebræ, and present very much the appearance of one continued sheet of muscle.

FIG. 24. Front view of the muscles of the palate, and posterior portion of pharynx: *a a* Superior constrictor of the pharynx; *b b* Middle constrictor of the pharynx; *c c* Inferior constrictor of the pharynx; *d d* Levator palati; *e* Uvula; *f f* Anterior half arch, containing the constrictor isthmi faucium muscles; *g* Tensor or circumflexus palati.

The *Superior Constrictor* (*a a* Fig. 24) arises from the cuneiform process of the occipital bone, from the lower part of the internal pterygoid plate of the sphenoid bone, from the pterygo-maxillary ligament, and from the posterior third of the mylo-hyoid ridge of the lower jaw, where it is connected with the last molar teeth. It is inserted with its fellow into the middle tendinous line on the back of the pharynx.

The *Middle Constrictor* of the pharynx (*b b* Fig. 24) arises from the appendix and cornu of the os-hyoides, and from the thyro-hyoid ligament—its fibres ascend, run transversely and descend, giving a triangular appearance—the upper ones overlap the superior constrictor, while the lower are beneath the inferior, and the whole pass back to be inserted into the middle tendinous line of the pharynx.

The *Inferior Constrictor* of the pharynx (*c c* Fig. 24) arises from the side of the thyroid cartilage and its inferior cornu, and from the side of the cricoid cartilage, and is inserted with its fellow in the middle line on the back of the pharynx.

This is the largest of the constrictor muscles, and overlaps the constrictor medius.

The action of all these muscles is, to lessen the cavity of the pharynx, and thus compel the food to take the downward direction into the œsophagus. The pharynx is lined by mucus membrane.

The *Stylo Pharyngeus* arises from the root of the styloid process, and is inserted into the side of the pharynx and corner of the os-hyoides and thyroid cartilage. It is a large and narrow muscle, and gets to the pharynx between the upper and middle constrictors. Its use is to elevate and draw forward the pharynx to receive the food from the mouth, also to raise the larynx.

THE SOFT PALATE. *

The *Soft Palate* (*c* Fig 24) is a moveable curtain, composed of mucus membrane and enclosing several muscles. It is situated

at the back part of the mouth between this cavity and the pharynx, is connected above to the posterior edge of the hard palate, and laterally to the side of the tongue and pharynx.

By this arrangement the soft palate is made a portion of a lunated or arched form between the cavity of the mouth and the pharynx.

In the centre of this arch an oblong body is suspended, called the uvula, which divides the soft palate into lateral half arches, that pass from the uvula on either side to the root of the tongue.

There is also seen passing from the uvula on each side to the pharynx, two other arches, which from being behind the first are called the posterior lateral half arches.

Between the anterior and posterior lateral half arches on either side there is a cavity containing the tonsil glands.

This cavity is the fauces, and the opening between the anterior lateral half arches is the isthmus of the fauces.

The muscles of the palate are four pair, and one single one, to wit:

1. The Levator Palati.
2. The Tensor or circumflexus Palati.
3. Constrictor Ishtmi-Faucium or Palato-Glossus.
4. Palato-Pharyngues.
5. Azygos-Uvulæ is the single muscle.

FIG. 25.



The *Levator Palati* (*b b* Fig. 25) arises from the point of the petrous bone and adjoining portion of the eustachian tube, descends and is inserted into the soft palate. Its use is to raise the palate.

FIG. 25. Posterior view of the muscles of the soft palate: *a* Roof of the mouth or hard palate; *b b* Levator palati; *c* Basilar portion of sphenoid bone; *d d* Eustachian tubes; *e* Tensor or circumflexus palati; *f* Azygos-uvulæ; *g g* Palato-pharyngeus, in posterior half arch.

The *Tensor* or *Circumflexus Palati* arises from the base of the pterygoid process of the sphenoid bone, from the eustachian tube, descends in contact with the internal pterygoid muscle, to the hamulus round which it winds, and is inserted into the soft palate where it expands and joins its fellow. Its office is to spread the palate.

Constrictor Isthmi-Faucium occupies the anterior lateral half arches of the palate; it arises from the side of the tongue near its root, and is inserted in the velum near the uvula.

It draws the velum down and closes the opening into the fauces.

Palato-Pharyngeus occupies the posterior lateral half arches of the palate, and extends from the soft palate behind, near the uvula as its origin, and is inserted into the pharynx, between the middle and lower constrictors and into the thyroid cartilage.

Its use is to draw down the velum and raise the pharynx.

Azygos-Uvula arises from the posterior spine of the palate bones at the termination of the palate suture, runs along the central line of the soft palate, and ends in the point of the uvula. It raises and shortens the uvula.

It is thus seen that the various muscles of the soft palate are all concerned, more or less, in conducting the food into the pharyngeal cavity. The elevators raise the palate, and at the same time protect the posterior-nares from regurgitation of the food, while the tensor puts it on the stretch—and after having passed the velum, the constrictor isthmi-faucium and palato-pharyngeus draw the palate down, and thus close the opening into the mouth, after which the food, as already mentioned, is grasped by the constrictor muscles of the pharynx and conveyed into œsophagus.

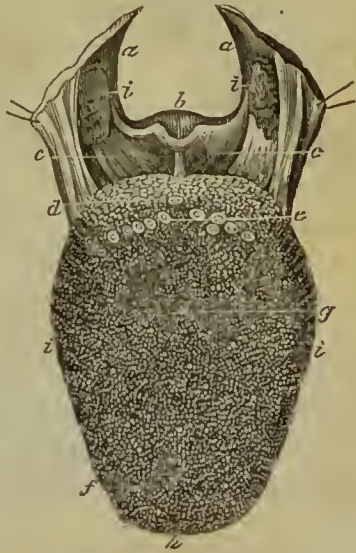
The *Tonsils* are two bodies, each about the size of an almond, seen at the root of the tongue on its side, and occupying the cavity between the anterior and posterior half arches. They consist of a congeries of mucus glands, forming somewhat of an

oval body, whose enlargement is a frequent obstacle to deglutition, and by their locality near the mouths of the eustachian tubes a frequent cause of obstruction and deafness.

THE TONGUE.

FIG. 26.

The Tongue is a very complicated organ, for it consists of a great variety of parts, and performs a great variety of functions, and although I have arranged it here as one of the organs of deglutition, it is nevertheless a glandular organ, to secrete—a sentient organ, to feel and taste—and likewise an intellectual organ, to assist in producing speech.



The Tongue is divided into its apex, body and root—the apex is the anterior loose and sharp portion—the root, which is thin, is attached to the os-hyoides and is posterior—while the body, which occupies the centre, is thick and broad—it is confined in its situation by reflections of the mucus membrane to be noticed hereafter.

The upper surface is rough from numerous eminences called the papillæ—which are distinguished into: 1. The Lenticular; 2. The Fungiform; 3. The Conical; and 4. Filiform papillæ.

The *Lenticular* are the largest in size, situated at the root of the tongue, are nine or more in number, and arranged after the manner of the letter N with the concavity looking forwards.

FIG. 26. A front view of the upper surface of the tongue and palatine arch: *a a* Posterior lateral half arches, containing the palato-pharyngei muscles and the tonsils; *b* Epiglottis cartilage; *c c* Ligament and mucus membrane, extending from root of tongue to base of epiglottis cartilage; *d* Foramen cecum or central one of lenticular; *e* Lenticular papillæ; *f* Papillæ filiformes; *g* Conical papillæ scattered over whole surface of the tongue; *h* Point of tongue; *i i* Fungiform papillæ seen on borders of the tongue.

They are generally spherical in shape, and consist simply of mucus follicles like those of the lips, palate, &c. &c. Behind these is observed a depression called the foramen cecum.

The *Fungiform* are next in size, and more numerous—they are found near the borders of the tongue, and present a round head supported on a thin pedicle.

The *Conical* are still more numerous and are seen scattered over the whole surface of the tongue, reaching from the lenticular to the apex. They are minute and tapering, and resemble small cones.

The *Filliform* papillæ are the smallest of all, and are said to occupy the intervals between the others, and are also found at the apex of the tongue.

All these papillæ, except the lenticular, from their being so freely supplied with mucus and blood vessels, and having a peculiar arrangement, belong essentially to the function of taste.

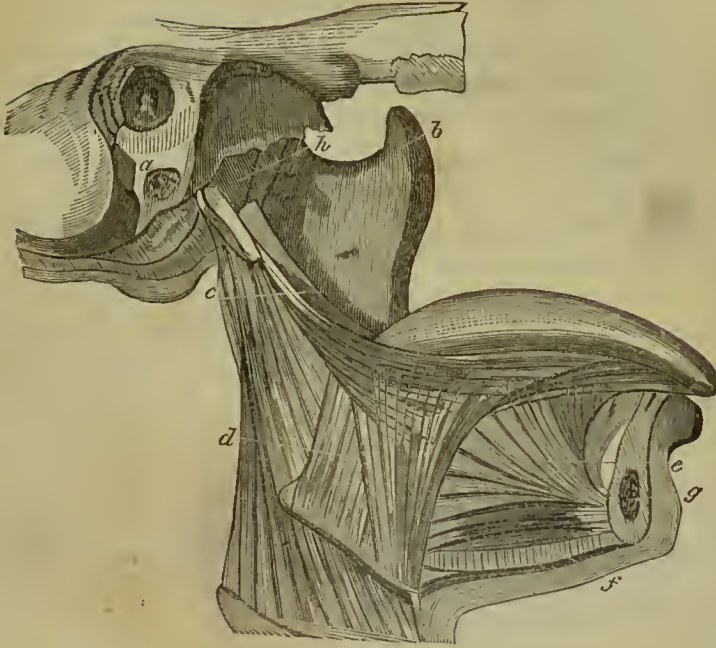
The great body of the tongue however is muscular in its structure, and its muscles are as follows:

1. The Stylo-Glossus.
2. Hyo-Glossus.
3. Genio-Hyo-Glossus.
4. Lingualis.

These constitute the muscles proper of the tongue. But there are some others which act more or less indirectly on the tongue and lower jaw. They are

1. The Digastricus,
2. The Mylo-Hyoideus, and
3. The Geno-Hyoideus.

FIG. 27.



The *Stylo-Glossus*, arises from the point of the styloid process and stylo-maxillary ligament. It is inserted into the side of the tongue near its root, its fibres running to the tip.

The *Hyo-Glossus*—a thin, broad, quadrilateral muscle, has its *origin* from the body, cornu, and appendix, of the os-hyoides, and is *inserted* into the side of the tongue, forming the greater part of its bulk.

The *Genio-Hyo-Glossus* is a triangular muscle, situated on the inside of the last, and having its *origin* from the upper tubercle on the posterior symphysis of the lower jaw, and its insertion into the body of the os-hyoides and the whole length of the tongue

FIG. 27. Lateral view of tongue and its principal muscles: *a* Mastoid process; *b* Coronoid process; *c* Stylo-glossus muscle; *d* Hyo-glossus muscle; *e* Genio-hyo-glossus muscle; *f* Genio-hyoid muscle; *g* Section of lower jaw at symphysis; *h* Styloid process.

from its base to its apex. The fibres of this muscle radiate in various directions through the tongue.

The *Lingualis* has its *origin* on the under surface of the tongue, extending from its base to the apex, and so intermingling with the other muscles as to be considered rather a part of them than a distinct one.

The *Digastricus*, as its name implies, consists of two bellies united in the middle by a tendon which passes through the stylohyoid muscle, and is attached to the hyoid bone. Of the two bellies, the one is posterior, and occupies the fossa at the end of the mastoid process of the temporal bone—the other is anterior, and extending from the os-hyoides to the base of the lower jaw by the side of the symphysis.

The *Mylo-Hyoideus* forms the floor of the mouth, and is a broad plane of muscular fibres, having its *origin* from the myloid ridge on the posterior surface of the inferior maxilla, and its *insertion* into the body of the os-hyoides.

The *Genio-Hyoideus* is a short, round muscle beneath the last, and has its *origin* from the lower tubercle on the back of the symphysis of the lower jaw, and *insertion* into the body of the os-hyoides.

All these muscles by their separate or combined action have the power of throwing the tongue into every possible variety of position and motion as concerned in the functions of deglutition, suction and speech. They can elevate, depress or turn the tongue to either side—they can protrude it from the mouth or draw it back to the pharynx—make its upper surface, or dorsum, either convex or concave, and finally can turn the tip, as is well known, either upwards, downwards, backwards, or laterally.

THE MUCUS MEMBRANE LINING THE MOUTH.

The whole interior cavity of the mouth, palate, pharynx and lips, are all covered by mucus membrane—and forming folds or

duplicatures at different points called frena or bridles. Beginning at the margin of the lower lip, this membrane can be traced lining its posterior surface, and from thence it is reflected on the anterior face of the lower jaw, where it forms a fold opposite the symphysis of the chin, the frænum of the lower lip; it is now traced to the alveolar ridge, covering it in front and passing over its posterior surface, where it enters the mouth. Here it is reflected from the posterior symphysis of the lower jaw to the under surface of the tongue, where it forms a fold or bridle called the *frænum lingua*. It now spreads over the tongue, covering its dorsum and sides to the root, from whence it is reflected to the epiglottis forming another fold; from this point it can be followed entering the glottis and lining the larynx, trachea, &c. &c.

In the same way commencing at the upper lip, it is reflected to the upper jaw, and at the upper central incisors forming a fold, the *frænum* of the upper lip—from this it passes over the alveolar ridge to the roof of the mouth, which it completely covers and extends as far back as the posterior edge of the palate bones—from this it is reflected downwards over the soft palate, or more strictly speaking, the soft palate is formed by the duplicature of this membrane at this point, between the folds of which are placed the muscles of the palate already described.

From the palate it is traced upwards and continuous with the membrane lining the nares, and downwards with the same lining the pharynx, œsophagus, stomach and intestinal canal.

The mucus membrane, after entering the nostrils and lining the roof, floor, septum nasi, and turbinated bones, enters the maxillary sinus between the middle and lower spongy bones, and lines the whole of this great and important cavity of the superior maxilla.

Many mucus glands or follicles, already enumerated, are scattered over the whole of this membrane, and furnish the mouth with its mucus.

As this membrane passes over the superior surface of the alveolar ridge of both jaws, its texture becomes changed, and receives the name of,

THE GUMS.

The gums are composed of thick, dense, mucus membrane, adhering to the periosteum of the alveolar processes, and closely surrounding the necks of the teeth.

They are remarkable for their insensibility and hardness in the healthy state, but exhibit great tenderness when diseased.

In the infant state of the gums, the central line of both dental arches present a white, firm, cartilagenous ridge, which gradually becomes thinner as the teeth advance—and in old age, after the teeth drop out, the gums again resume somewhat their former infantile condition, showing, "Second-Childhood."

The Dental Ligament so recently discovered by a Dentist formerly of Virginia, as attached to the necks of the teeth, and confirmed, I am sorry to add, by Dr. Goddard, bears no more resemblance to true ligament than the nails do to bone.

THE ALVEOLO-DENTAL PERIOSTEUM.

This membrane may be properly noticed here, as it is considered by some continuous with the gums. It lines the *alveolar cavities* or sockets of the teeth, covers the roots of each—is attached to the gums at the necks, and to the blood-vessels and nerves where they enter the roots of the teeth at their apices; and further, Mr. Thomas Bell believes it is traced into the cavities of the teeth, forming their lining membrane, and continuous, or the same with that of the pulp.

The original sac for the pulp has been stated in another place to consist of two membranes, an outer and an inner—these are attached to the gums, and when the teeth come through these membranes and the gums, the remaining part of the sac, especially its outer coat, is supposed by some to constitute the alveolo-dental periosteum, and to be continuous with the gums—while on the other hand Mr. Bell believes both membranes of the sac wholly absorbed, and that the true alveolo-dental periosteum is the same as the periosteum covering the upper and lower

maxillary bones, and continues into the alveolar cavities, lining their parietes, and thence reflected on the roots of the teeth.

It matters little whether this membrane be a continuation of the gums, the remains of this pulp sac, or the extension of the periosteum of the maxillary bones into the alveolar cavities, since the great practical truth still remains the same, that there is a membrane lining the alveolar cavities and investing the roots of the teeth, and that this membrane is fibrous.

This membrane constitutes the bond of union between the alveolar cavities and the roots of the teeth.

CHAPTER FIFTH.

BLOOD-VESSELS OF THE MOUTH.

FIG. 28.



THE arteries supplying the mouth come from the external carotid. This is a division of the common carotid which

FIG. 28. A view of the arteries supplying one side of the mouth and face: *a a* External carotid artery; *b b* Inferior maxillary bone with the anterior plate removed so as to expose the roots of the teeth and the inferior dental artery; *c* Posterior mental foramen, through which the inferior dental artery passes; *d* Anterior mental foramen where the same artery comes out to supply the muscles of the lower lip; *e e* Superior maxillary bone with the lower part of the anterior and outer wall removed, showing the arteries going to the roots of the teeth and the cavity of the

arises on the right from the arteriora-innominata, and on the left from the sub-clavian—after passing up the neck on either side along the course of the sterno-cleido-mastoid muscles, it divides on a level with the top of the thyroid cartilage into its two great branches, to wit, the external and internal carotid arteries.

The *Internal Carotid Artery* has a tortuous course, is first to the outside and behind the external carotid—then ascends in front of the vertebral column by the side of the pharynx and behind the digastric and styloid muscles to the foramen caroticum in the petrous portion of the temporal bone—thence it traverses the canal in this bone and enters the brain, supplying it with the most of its vessels—not giving any to the mouth.

The *External Carotid* (a a Fig. 28) extends from the top of the larynx to the neck of the condyle of the lower jaw; it is at first anterior and to the inside of the internal carotid, soon gets to the outside, then passes under the digastric and stylo-hyoid muscles and lingual nerve, becomes imbedded in the parotid gland, and finally terminates at the point indicated in the temporal and internal maxillary arteries.

The branches of this artery supply all the organs belonging to the four primary stages of digestion, namely, those of *Prehension*, *Mastication*, *Insalivation*, and *Deglutition*.

THE ARTERIES OF PREHENSION.

These belong principally to the lips, and come chiefly from the facial artery.

The *Facial Artery* is the third branch of the external caro-

antrum; *f* Infra-Orbital foramen, through which passes the infra-orbital artery; *h* Nasal process of superior maxillary bone; *i* Pterygoideus internus muscle; *j* Angle of inferior maxillary bone; *k* Orbit of the eye; *l* Superior thyroid artery; *m m* Facial artery; *n* Terminating branch of the lingual artery; *o* Termination of external carotid into the temporal and internal maxillary branches; *p* Temporal artery; *q* Internal maxillary artery; *r r* Inferior dental artery; *s* Deep temporal branch; *t* Transverse artery of the face; *u u* Muscular branches; *v* Alveolar branch; *w* Posterior dental branch; *x* Terminal branch of infra-orbital artery; *y* Nasal branch of the facial; *z* Sub-mental branch.

tid. It ascends to the sub-maxillary gland, behind which it passes on to the bone of the lower jaw—thence it goes in front of the masseter muscle to the angles of the mouth, and finally terminates at the side of the nose by anastomosing with the ophthalmic arteries.

In its course it gives off the sub-mental, inferior labial, superior and inferior coronary arteries—which mainly supply the elevators, depressors, and circular muscles of the mouth, or those agents concerned in the first steps of digestion—the prehension of the food.

THE ARTERIES OF MASTICATION.

These come from the internal maxillary and the temporal—the two terminating branches of the external carotid.

The *Internal Maxillary Artery* commences in the substance of the parotid gland opposite the meatus and internus externus—then goes horizontally behind the neck of the condyle of the lower jaw to the pterygoid muscles, between which it passes, and then proceeds forwards to the tuberosities of the superior maxillary bones—from thence it takes a vertical direction upwards between the temporal and external pterygoid muscles to the zygomatic fossa, where it again becomes horizontal, and finally ends in the spheno-maxillary fossa by dividing into several branches.

Those branches of the internal maxillary supplying the passive organs of mastication, or the superior and inferior maxillary bones, with the teeth, are the

Inferior Maxillary or Dental Artery,
The Alveolar or Superior Dental,
The Infra-Orbital, and
The Spheno-Palatine.

The *Inferior Dental Artery* enters the posterior mental foramen of the lower jaw, passes along the dental canal beneath the roots of the teeth—sending up a twig through the aperture of each to the pulps of the teeth as it passes along, and finally

escapes at the anterior mental foramen on the face—a branch of it, however, continues forwards to supply the incisors.

The *Superior Dental Artery* winds around the maxillary tuberosity from behind forwards, sending off twigs through the posterior dental canals which supply the molares, and go to the maxillary sinus—while the main branch is continued forward, furnishing the gums.

The *Infra-Orbital Artery* enters the infra-orbital canal, traverses its whole extent, and comes out at the foramen of the same name, upon the face; just before it emerges it sends down the anterior dental canal a twig for the incisors and cuspidati.

The *Superior Palatine* after entering the nose and supplying the tubinated bones, proceeds to the maxillary sinus.

The arteries supplying the *active organs of mastication*, to wit: the temporal, masseter, and pterygoid muscles, are

The temporal anterior and posterior deep—the pterygoid and masseteric branches—the internal maxillary artery—while the *temporal artery*, which is the other terminating branch of the external carotid, gives off the middle temporal artery to the temporal muscle, and a branch, the transverse artery, to the masseter.

The *Temporal Artery* begins in the substance of the parotid gland at the neck of the condyle of the lower jaw, mounts over the zygoma in front of the meatus, and ascends about an inch or more when it divides into its anterior and posterior branches.

THE ARTERIES OF INSALIVATION.

These belong to the salivary glands. The parotid is supplied by the posterior auricular, a branch of the external carotid, and by the transverse artery of the temporal. The sub-maxillary is supplied by the facial and the sub-lingual by a branch of the lingual artery.

THE ARTERIES OF DEGLUTITION.

The pharynx, soft-palate and tongue are the organs supplied by these arteries.

The *Arteries of the Pharynx* are the superior and inferior pharyngeal and the inferior palatine.

The superior is a branch of the internal maxillary, and the inferior a branch of the external carotid—while the lower palatine is given off by the facial.

The *Arteries of the Soft-palate* are,

The superior palatine, inferior palatine, and inferior pharyngeal branches.

The *Superior Palatine* comes off from the internal maxillary behind the orbit in the pterygo-maxillary fossa, descends in the posterior palatine canal, comes out on the back part of the roof of the palate through a foramen of the same name, and proceeds inwards and forwards, supplying the soft palate and mucus membrane.

The *Inferior Palatine* is a branch of the facial, and the inferior pharyngeal a branch of the internal maxillary.

The *Arteries of the Tongue* are the *Lingual*. These arteries, one on either side, arise from the external carotid, run forwards above and parallel with the os-hyoides—then ascend to the under surface of the tongue as far as the tip under the name of the *ranine* arteries. They give off numerous branches in their course, supplying every part of the tongue.

The mucus membrane of the mouth is principally supplied by the anterior and posterior palatine, and facial arteries.

The gums by the alveolar and sub-mental branches.

THE VEINS.

The veins correspond so nearly, both in name and course with the arteries, that a description of them would be only a repetition of what has been said—suffice it therefore to observe, that there are two veins to every artery, and that they are mostly collected into a common trunk at the angle of the jaw, called the external jugular vein, which passes down the neck in the course of the fibres of the platysma muscle, and terminate in the sub-clavian vein at the posterior edge of the sterno-mastoid muscle.

The office of the veins is to return the blood back to the heart.

The *Branches* of the *External* carotid artery as they arise in numerical order, are as follows:

1. The Superior Thyroid.
2. The Lingual.
3. The Facial.
4. The Inferior Pharyngeal.
5. Occipital.
6. Posterior Auricular.
7. Temporal.
8. Internal Maxillary.

The internal maxillary being the great artery of the mouth, gives off branches in the following order:

- | | | |
|---|---|---|
| Origin behind the neck
of the Condyle. | { | 1. A Tympanic Branch,
2. Inferior Dental,
3. The Greater Meningeal,
4. Lesser Meningeal. |
| Origin between Ptery-
goid Muscles. | { | 5. Posterior Deep Temporal Artery,
6. Masseteric,
7. Pterygoid Arteries. |
| Origin Zygomatic
fossa. | { | 8. Buccal Artery,
9. Anterior Deep Temporal,
10. Alveolar or Superior Dental,
11. Inferior Orbital. |
| Origin Spheno-Maxil-
lary fossa. | { | 12. Pterygoid or Vidian,
13. Superior Pharyngeal,
14. Superior Palatine,
15. Spheno-Palatine Artery. |

CHAPTER SIXTH.

THE NERVES OF THE MOUTH.

FIG. 29.

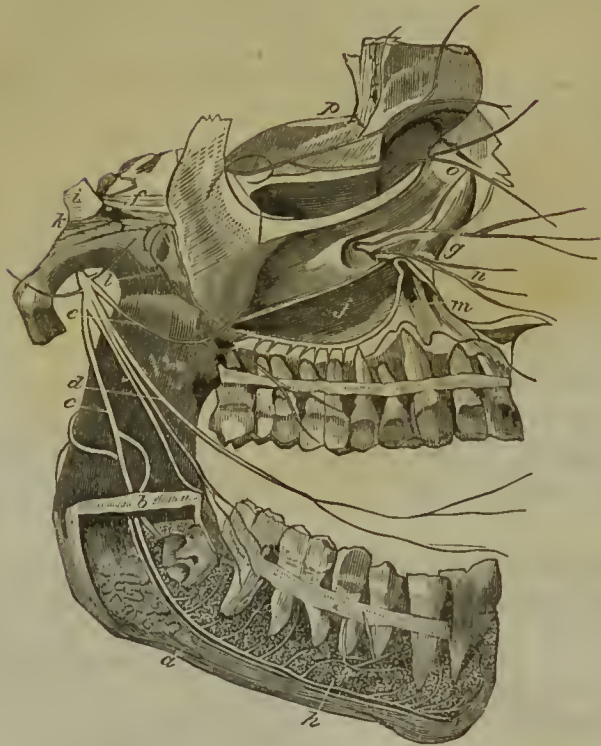


FIG. 29. The fifth nerve with its branches: *a* The inferior maxillary bone; *b* Posterior dental foramen where the inferior dental nerve enters to supply the teeth; *c* Inferior dental nerve; *d* Gustatory branch of fifth nerve; *e* Muscular branch of inferior maxillary nerve; *f* Ophthalmic nerve; *g* Infra-orbital foramen where infra-orbital nerve comes out; *h* Terminating branches of inferior dental nerve; *i* Casserian ganglion; *j* Internal view of maxillary sinus; *k* Superior maxillary nerve just where it is given off from the ganglion; *l* Posterior dental branch of superior maxillary nerve; *m* Anterior dental branch of inferior dental nerve; *n* Terminating branches of infra-orbital nerve; *o* Nasal branch of ophthalmic nerve; *p* Frontal branch of ophthalmic nerve.

THE nerves supplying the mouth belong to the fifth pair, and the portio-dura of the seventh or facial nerve.

The *Fifth* (Trigemini) are the largest of the cranial nerves, and give sensibility to all the organs concerned in the primary stages of digestion.

And further, this nerve will be found to be a compound nerve, having also motor filaments, and thereby giving motion as well as sensation.

It is first seen at the side of the pons-varolii near its junction with the crura-cerebelli—but its origin is much deeper and further back.

It arises by two fasciculi which can be traced down to the spinal chord, and coming from its anterior and posterior ends. It is hence considered a spinal nerve, and as such called the cranial-spinal nerve.

These two fasciculi, the one anterior and the other posterior, constitute the fifth nerve, which consists of eighty or one hundred filaments that pass forwards and outwards in a canal formed of dura-matter to a depression on the anterior surface of the petrous bone.

At this point it spreads into a ganglion, called the Casserian ganglion—on the under surface of which is seen the anterior root, but having no connection with the ganglion, and can be traced on, as will be presently shown, to the inferior maxillary nerve.

From the ganglion of Casser proceed three primary branches, to wit:

1. The Ophthalmic.
2. Superior Maxillary.
3. Inferior Maxillary Nerves.

The *Ophthalmic Nerve* is a short trunk that goes into the orbit

through the foramen lacerum superius, and divides into three principal branches, namely:

1. The Frontal,
2. The Lachrymal, and
3. The Nasal.

The *Frontal* passes along the roof of the orbit to the supra-orbital foramen through which it passes, and is then called the supra-orbital nerve, and is spent on the muscles and integuments of the forehead. It gives off several branches in its course.

The *Lachrymal*, as the term implies, goes to the lachrymal gland, taking the outward direction and sending branches in its course to the upper lid, conjunctiva and other parts.

The *Nasal* takes its direction along the inner side of the orbit to the anterior ethmoidal foramen, through which it passes into the cranium, on the upper surface of the cribriform plate of the ethmoidal bone, descends by the side of the crista-galli through a slit-like opening into the nose and there terminates by filaments which are spent upon the septum, mucus membrane, anterior nares, &c. &c. It sends off several branches in its course, one in particular to the lenticular ganglion at the bottom of the eye, others to the caruncula lachrymalis, lachrymal sac, conjunctiva, &c. &c., but as these do not belong to the mouth and Dental apparatus, I will pass to the second great division of the fifth, to wit:

THE SUPERIOR MAXILLARY NERVE.

This nerve proceeds from the middle of the Casserian ganglion, passes through the foramen rotundum of the sphenoid bone, into the pterygo-maxillary fossa—here it enters the canal of the floor of the orbit, the infra-orbital canal, traverses its whole extent, and emerges on the face at the infra-orbital foramen, where it terminates in numerous filaments in the muscles and integuments of the upper lip and cheek.

The superior maxillary nerve supplies the upper jaw, and gives off many important branches, which are as follows:

In the pterygo-maxillary fossa two branches descend to a small reddish body called the ganglion of Meekel or the sphenopalatine ganglion, which is situated on the outer side of the nasal or vertical plate of the palate bone.

From this ganglion proceed three branches,

1. An Inferior, Descending, or Palatine Nerve.
2. An Internal, Lateral Nasal, or Sphenopalatine.
3. A Posterior, Pterygoid, or Vidian.

The *Palatine Nerve* descends through the posterior palatine canal and comes out at the posterior palatine foramen, along with an artery of the same name, and supplies with filaments the soft palate, uvula, tonsils, the roof of the mouth, and the inner alveoli and gums.

The *Lateral Nasal* enters the nose through the sphenopalatine foramen, and divides into several filaments which enter the mucus membrane covering the upper and lower turbinated bones, and one long branch can be traced along the septum nasi as far as the foramen incisivum, where it meets the anterior palatine branches in a ganglion called the naso-palatine.

The *Vidian* or *Pterygoid* passes backwards from the ganglion of Meekel through the pterygoid canal at the root of the pterygoid process—then enters the cranium through the foramen lacerum anterius, and divides into two branches, one of which enters the carotid canal and unites with the sympathetic branches of the superior cervical ganglion—thus connecting this ganglion with the ganglion of Meekel.

The other, the proper vidian nerve, enters the vidian foramen or hiatus Fallopii on the petrous bone, joins the portio-dura nerve, accompanies this as far as the back part of the tympanum, then leaves it, enters the cavity of the tympanum, and receives here the name of *Corda Tympani*. It leaves this cavity, after supplying the several parts, by the glenoid fissure, now joins the gustatory nerve, continues with it to the sub-maxillary gland, where it parts

and is lost in the sub-maxillary ganglion—which is situated at the posterior part of the sub-maxillary gland.

This exceedingly intricate course of the vidian nerve is interesting from the number of communications which it establishes between different and distant parts—for it unites the ganglion of Meekel with the superior cervical ganglion of the sympathetic and both with the sub-maxillary ganglion—it also connects the superior and inferior maxillary nerves to one another and the portio-dura.

The *Superior Maxillary Nerve* gives off next in the spheno-maxillary fossa,

1. The Orbital.
2. The Posterior Dental Nerves.

The *Orbital* enters the orbit through the spheno-maxillary fissure, and then sends off a *malar* and *temporal* branch which pass out through the malar bone, the first supplying the cheek, the latter accompanying the temporal artery to the integuments of the side of the head.

The *Posterior Dental Nerves*, three or four in number, descend on the tuberosity of the superior maxillary bone and enter the posterior dental canals to supply the molar teeth—one branch penetrates the antrum and courses along the outer wall, anastomosing with the anterior dental nerves—while another runs along the alveolar border supplying the gums.

The superior maxillary nerve now enters the infra-orbital canal, and becomes the *infra-orbital nerve*, which is its terminating branch.

The *Infra-Orbital* nerve comes from behind forwards through the canal of the same name, and gives off no branch until it arrives at the forepart, where it sends down along the front of the maxillary sinus in the anterior dental canal the *anterior dental nerve*, which divides so as to supply the incisors, cuspidati and bicuspidates, also the mucus lining membrane of the antrum.

This nerve now emerges, as before mentioned, at the infra-orbital foramen, beneath the orbicularis and levator labii superioris alæque nasi muscles, dividing here into many branches, some of which ascend to the nose and eyelids, others pass downwards and outwards to the lip and cheek, anastomosing with the nasal branch of the ophthalmic and the facial branches of the portio-dura.

THE INFERIOR MAXILLARY NERVE.

This nerve forms the third great division of the fifth. It is the largest branch, and passes from the ganglion of Casser through the foramen ovale of the sphenoid bone to the zygomatic fossa.

This nerve, as stated, is united to the anterior or motor root, which come together on the outside of the foramen ovale, then in the zygomatic fossa, the inferior maxillary nerve divides into two branches:

1. An External, or Superior,
2. An Internal, or Inferior.

The *External* is the motor branch, and gives off the following filaments to the several muscles:

1. *Masseteric* crossing the Sigmoid notch to the Masseter Muscle.
2. *Temporal* Anterior and Posterior Deep to the Temporal Muscle and Fascia, &c. &c.
3. *Buccal* to the Buccinator, &c. &c.
4. *Pterygoid* to Pterygoid Muscles.

The *Internal* division of the inferior maxillary nerve consists of three branches, all of which give sensation, and are:

1. The Anterior Auricular.
2. The Gustatory.
3. The Inferior Dental.

The *Anterior Auricular* passes behind the neck of the lower jaw and in front of the meatus of the ear, and ascends through the parotid gland, over the zygoma along with the temporal artery, and divides into anterior and posterior branches.

In its course it unites with the facial nerve, and supplies the parotid gland, the articulation of the lower jaw, the meatus, and cartilages of the ear and side of the head.

The *Gustatory Nerve*, immediately after its origin, sends a branch to the inferior dental; it then descends between the pterygoid muscles, where the corda tympani joins it, it now passes along the ramus of the lower jaw covered by the internal pterygoid muscle, then above the sub-maxillary glands, and forwards above the mylo-hyoid and between it and the hyo-glossus muscles, accompanied by the duct of Wharton, and finally ascends above the sub-lingual gland to the lateral, inferior, and anterior parts of the tongue.

In its course, Mr. HARRISON enumerates the following branches as given off by this nerve:

“First, one or two small filaments to the internal pterygoid muscle. Second, several to the tonsils, to the muscles of the palate, to the upper part of the pharynx, and to the mucus membrane of the gums. Third, the chorda tympani, and some accompanying filaments to form a plexus, which supplies the sub-maxillary gland. Fourth, a few branches which descend along the hyo-glossus muscle to communicate with the ninth or lingual nerve. Fifth, a fasciculus of nerves to the sub-lingual gland and to the surrounding mucus membrane. Lastly, at the tongue it divides into several branches, some pass deep into the tissue of this organ, others long, firm and soft, rise towards its surface, and are lost in the mucus membrane and in small conical papillæ near its tip.”

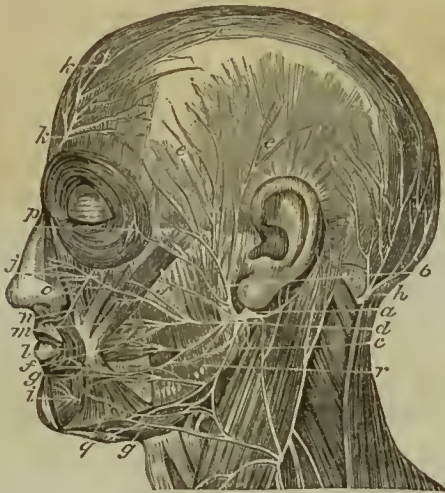
The *Inferior Dental Nerve* passes between the pterygoid muscles, then along the ramus of the lower jaw under the pterygoideus internus to the posterior mental foramen which it enters along with an artery and vein, it now traverses the inferior dental canal, sending off twigs into all the roots of the molares and bicuspidæ. Opposite the anterior mental foramen it divides into two branches, the smaller is continued forward in the substance of the jaw to supply the roots of the cuspidati and incisors—

while the larger comes out at the mental foramen, and is distributed to the muscles and integuments of the lower lip.

The inferior dental, just as it enters the posterior dental foramen, gives off the *mylo-hyoid* nerve; this passes forwards in a groove of the lower jaw, and supplies the mylo-hyoid, genio-hyoid and digastric muscles.

The *Portio-dura* of the seventh or facial nerve, is the last nerve to be noticed as particularly belonging to the mouth.

FIG. 30.



The *Facial Nerve* arises from the medulla oblongata between the corpus olivare and restiform close by the lower margin of the pons-varolii—it then passes forwards and outwards with the portio-mollis, to the foramen auditorium internum, which it enters and passes on to the base of this opening—here these two nerves

FIG. 30. View of the facial nerve, or portio-dura of the seventh pair: *a* Trunk of the facial nerve; *b* Ascending branch; *c* Descending branch; *d* Posterior auricular branch; *e e* Temporal branches; *f f* Malar branches; *g g* Inferior maxillary branches; *h* Posterior or great occipital nerve; *i* Terminal branches of the inferior dental nerve; *j* Terminal branches of infra-orbital nerve; *k k* Supra-orbital nerve and its branches; *l* Orbicularis oris; *m* Zygomaticus major; *n* Zygomaticus minor; *o* Levator labii superioris alæque nasi; *p* Orbicularis palpebraum; *q* Depressor anguli oris.

separate, the mollis going to the labyrinth of the ear—while the facial enters the aqueduct of Fallopius, where it is joined by the vidian; it then goes in a curved direction outwards and backwards behind the tympanum, where it parts with the vidian, and proceeds on to the stylo-mastoid foramen, at which it emerges. At this point it sends off three small branches: 1. The Posterior Auricular; 2. The Stylo-Hyoid; 3. The Digastric—which are distributed behind the ear, to the stylo-hyoid and digastric muscles.

The facial nerve being deeply imbedded in the substance of the parotid gland, divides into two branches, the one is superior, the other inferior; these two have frequent unions called the *pes-anserinus* or *parotidian plexus*.

The upper branch, called the temporo-facial, ascends in front of the ear upon the zygoma, accompanies the temporal artery and its branches, supplying the side of the head, ear and forehead, and anastomosing with the occipital and supra-orbital nerves—a set of branches pass transversely to the cheek, rami malares, furnishing the lower eyelid, lips, side of the nose, and uniting with the infra-orbital nerve.

The inferior or cervico facial branch descends, supplying the lower jaw and upper part of the neck, giving off the following branches:

1. The Maxillary.
2. The Sub-Maxillary.
3. The Cervical.

The *Maxillary* passes the ramus of the jaw and masseter muscle to the lower lip and its muscles.

The *Sub-Maxillary* courses the base of the lower jaw, supplying the muscles which arise from this part, and both anastomosing with the mental nerve.

The *Cervical* are long and numerous, and go to the platysma and superficial muscles of the neck—uniting with branches from the cervical plexus.

The faeial is the great motor nerve of the face. Mr. Bell calls it a respiratory, and thinks it chiefly concerned in expressing the passions.

The *Formation* and *Progress* of the teeth, might seem to come most naturally under consideration in this place, but I defer their description to a succeeding chapter, to which the reader is referred.

ANATOMICAL RELATIONS OF THE MOUTH.

The mouth has many interesting anatomical relations with the rest of the body, a few of which it may be well to mention.

By means of its lining mucus membrane it is connected through similar continuity of structure with the stomach and the whole of the intestinal canal, liver, &c. &c.

Disease still further establishes this structural relation. Inflammation, ulceration, or any other anatomical change in the stomach or intestines is felt and reported on the tongue, gums and other parts of the mouth, showing the sympathy and the close anatomical relationship of these several parts.

The mouth is also connected by the same mucus membrane with the organs of respiration by being continued down into the larynx, trachea and bronchia.

By the fifth pair of nerves, the mouth, and especially the dental apparatus, has a most important relation with the brain, nervous system, and all the parts dependent on them.

Simple irritation from teething has frequently thrown children into convulsions—and in adults tooth-ache often creates extreme irritability of the whole nervous system. But it is not necessary to dwell here on the morbid sympathies of the mouth with other parts of the body, as it is the intention of the author to refer more particularly to the subject in a subsequent part of the work. It will be well, however, to mention in this place, that there is a general anatomical relation of the mouth with the rest of the body by means of the blood-vessels and cellular tissue.

These latter are the most pervading general elements of the body; they are found every where connecting, and binding together, all the organs in one great and common family, and in this manner the mouth is related to and forms an essential link in this natural chain.

PHYSIOLOGICAL RELATIONS OF THE MOUTH.

The mouth has been shown to consist, not only of a great variety of parts, but also, that it has an equally great variety of functions.

The functions of the mouth have been stated to be those of prehension, mastication, insalivation, and deglutition.

These functions it has been seen are all closely related the one with the other and mutually dependent—and how beautiful is the harmony of action as well as its regular and orderly succession. We see in the first place the prehensile instruments laying hold of and introducing the food into the mouth—then the organs of mastication, the teeth and upper and lower jaw bones, put into operation by the temporal, masseter and pterygoid muscles, grind it down into minute portions, which at the same time is formed into a bolus by being mixed with the salivary fluids—furnished by the parotid, sub-maxillary, and sub-lingual glands; then it is taken by the organs of deglutition, to wit: the tongue, palate, and pharynx, and passed by these into the oesophagus to be thence conducted into the stomach—thus demonstrating the harmony of relation among the several functions belonging to the mouth.

But the functional relation of the mouth is not more confined to itself than its structural relation—the one is equally commensurate with the other; and as the structure of the mouth has been shown to be continuous with, and to extend to the most extreme parts of the body, so we find that the functions of the mouth equally involve all the great, general and leading functions of the body.

For example, if the primary stages of digestion be impaired or improperly performed in the mouth—the whole process of digestion must also be necessarily imperfect—the stomach will form bad chyme, the intestines bad chyle, and this impure fluid will go to the heart and lungs where bad blood will be formed, and as a

necessary consequence the functions of circulation, respiration, and innervation also implicated, and in this way we see, that by disturbing only one link, and at once the brotherhood of the great functional chain becomes broken.

Again, the mouth is intimately related with the intellectual functions—as for instance that of speech. Who does not know that when any of the teeth are wanting, the palate cleft, or there is a hare-lip, how much the speech is impaired? And so with all the other functions of the body, the relation between them and the mouth and the mutual dependence of each on the other is equally demonstrable.

If these remarks be true, the conclusion is irresistible, that the two sciences of Dentistry and Medicine are essentially and inseparably connected, and that as a necessary consequence the dental student to become properly acquainted with his profession must also combine a general knowledge of medicine, anatomy and physiology.

CHAPTER SEVENTH.

OF THE ORIGIN AND FORMATION OF THE TEETH.

OF all the operations of the animal economy, none are more curious or interesting than that which is concerned in the production of the teeth. In obedience to certain developmental laws, established by an All-wise Creator, it is carried on from about the sixth or seventh week of intra-uterine existence, except when interrupted by local or general disease, or some other cause, with the nicest and most wonderful regularity until the completion of the organs; and although so secretly conducted as to prevent the closest scrutiny from detecting the manner by which it is effected, enough is ascertained from its progressive results to excite in the mind of the physiologist the highest admiration.

From small mucous papillæ, observable at a very early period of fœtal life, situated in a groove lined with the mucus membrane of the mouth, and running along the alveolar border of each jaw, which is at first shallow, but deepening until its edges unite and it becomes divided by the formation of transverse septa into separate and distinct compartments or follicles, one for each tooth, they gradually augment until they attain the shape and size of the crowns of the several classes of teeth they are respectively destined to produce. Having arrived at this stage of their formation, they now begin to ossify, first upon the cutting edges of the incisors, the apices or points of the euspidati and bicuspidates, and eminences of the molares; from thence over the whole surface of their crowns, until they become invested in a complete layer of bone; and so on, layer after layer, one within the other, is formed, until the process of solidification is completed. But before this process has progressed very far, the enamel and roots of the teeth begin to form, and these, including dentition, are gone

through with previously to the completion of the ossification of the pulps.

In the mean time, and in anticipation of the loss of the first denture, a second is forming, and as the teeth of the one are removed, they are promptly replaced by those of the other. Thus, by this beautiful and most admirable provision of nature, the first set of teeth intended to subserve the wants only of childhood, while the jaws are too small for the reception of such as are required for an adult, are removed, and replaced by a larger, stronger and more numerous set.

The elder writers, regarding a knowledge of the early stages of the development of the teeth as not of great importance, paid but little attention to the subject, and hence this most curious and interesting department of developmental anatomy has remained, until recently, measurably uncultivated. *EUSTACHIUS*, I believe, was the first to notice the position and arrangement of the teeth in the jaws previously to their eruption. But his researches were confined to the examination of the jaws after birth, at which period he speaks of having discovered, by dissection, the incisors, cuspидati and three molares on each side in each jaw, partly in a gelatinous and partly in an ossified condition. He also discovered the incisors and cuspидati of the permanent set behind the first.

Eustachius wrote in 1563, and nineteen years later, *URBAIN HEMARD*, a French anatomist and surgeon, although unacquainted with the work of the former, gave a very similar description of the disposition of the crowns of the incisors and cuspидati of both sets in the jaws of an infant at birth. He represents them as partly bony and partly mucilaginous. He also discovered some of the molares, but he says he was unable to find the great ones at so early a period as birth.

The researches of *ALBINUS* threw no additional light upon the manner of the formation of the teeth, and little was known concerning the earlier stages of the development of these organs until the time of *John Hunter*, who informs us that in the alveoli of a fœtus of three or four months, "four or five pulpy sub-

stanees, not very distinct, are seen." But he says, "about the fifth month" the alveolar cavities are more perfect and the pulps of the teeth more distinct," and that the anterior are more advanced than those further back in the jaws. And it is at about this age that he dates the commencement of ossification on the edges of the first incisors. The situation and arrangement of the crowns of the teeth in the jaws at this period he describes very accurately. At the expiration of the sixth or seventh month, he represents the first permanent molaris as having begun to be formed in the tubercle of the upper jaw, and "under and on the inside of the coronoid process in the lower," and he states that the pulps of the permanent central incisors begin to appear in a fœtus of "seven or eight months," and to ossify "five or six months after birth." The pulps of the permanent lateral incisors and cuspidati he says begin to be formed soon after birth, the first bicuspidates about the fifth or sixth year, the second bicuspidates and molares the sixth or seventh, and the third molares or dens sapientiæ about the twelfth year.

Although Mr. Hunter gives a more minute and accurate description of the progress of the formation and arrangement of the teeth in the jaws previously to their eruption, than any previous writer, yet with regard to their origin and appearance during the earlier stages of their formation, it is unsatisfactory. Nor do the researches of Jourdain, Blake, Fox, Cuvier, Serres, Delabarre and other writers upon the teeth, whose names I might mention, throw much additional light upon the subject. In fact they could not, as they do not seem to have been commenced at periods sufficiently early in fœtal subjects; and even from the time when they were first instituted, the progress of the organs do not appear to have been traced through the subsequent stages of their formation with the requisite degree of care and accuracy. It is not, therefore, necessary to notice the description given by these authors of the progress of the formation of the teeth, although it may not be amiss, to state here, that Dr. Blake describes the rudiments of the permanent as originating from the sacs of the temporary, and that this supposed discovery has been confirmed by almost every subse-

quent writer upon the subject.* Indeed, until quite recently, this has been the prevailing opinion, and their progress, step by step, from the time when the rudiments of these teeth are apparently given off as small bud-like processes from the sacs of the temporary, is traced with a degree of minuteness by Mr. Thomas Bell, that would seem to preclude the possibility of deception. This last named gentleman describes the process as commencing at a very early period of the formation of the temporary teeth, and as first perceivable "in a small thickening on one side of the parent sac," which, "gradually increasing," becomes "more and more circumscribed, until it at length assumes a distinct form, though still connected with it by a peduncle, which," he says, "is nothing more than a process of the investing sac." "For a time," continues Mr. Bell, "the new rudiment is contained within the same alveolus with its parent, which excavated by the absorbents for its reception, by a process almost unparalleled in the phenomena of physiology. It is not produced by the pressure of the new rudiment, as is erroneously believed, but commences in the cancelli of the new bone immediately within its smooth surface, thus constituting what may be termed a process of anticipation. The new cell after being sufficiently excavated, and as the rudiment continues to increase, is gradually separated from the former one, by being more and more deeply excavated in the substance of the bone, and also by the deposition of a bony partition between them; and at length the new rudiment is shut up in its proper socket, though still connected with the temporary teeth by a chord or process of the capsule already described, which has in the meantime been gradually attenuated and elongated."†

* It is said, but with how much truth I am unable to say, that this supposed discovery was made about twenty years before the publication of Dr. Blake's *Inaugural Dissertation*, by a French Dentist by the name of Herbert.

† This chord has been noticed and minutely described by several other writers. Delabarre calls it the appendage of the dental matrix, and traces it through what is usually denominated the alveolo-dental canal, but which he designates by the name of *iter dentis*, to the surface of the gum behind the temporary teeth. He also states that it is hollow, and when he first described it in his thesis of reception in 1806, it had not been noticed by any other writer.

Now it would hardly seem possible for a man of Mr. Bell's accuracy of observation, after having investigated the subject as closely and thoroughly as he must have done, to have enabled him to describe so minutely the various stages of the progress of the development of the permanent teeth, to have mistaken their origin, and that he has, would appear, by subsequent researches, to be rendered almost certain. I allude to those of ARNOLD and GOODSIR.

The last named author has traced the progress of the teeth, almost from the moment of the appearance of the germs of the first set, as simple mucous papillæ, until the completion of the second, and so minutely and accurately, that little remains to be done by future anatomists, for the perfection of this branch of odontology.

Relying upon the accuracy of his researches, which are described at length in the *Edinburg Medical and Surgical Journal*, for January 1st, 1839, I shall proceed to give a brief summary of their result, as the length of the paper is such as to preclude its insertion entire.

They were commenced in an "embryo at the sixth week," at which period a deep groove, formed by two semi-circular folds, extending around each jaw, is perceived, lined with the mucus membrane of the mouth, and as this gradually widens "from behind forwards," a ridge, commencing posteriorly and running in the same direction, rises from its floor, and 'divides the original groove into two others;' the outer one forming the duplicature of mucus membrane from the inside of the lip to the outside of the alveolar process, the inner one constituting what may be very properly denominated the "*primitive dental groove*," as the germs of the teeth appear in it.

The inner lip of the inner groove is formed by the outer edge of a "semi-circular lobe" which is to constitute the future palate. By the seventh week after conception, the germ of the first temporary molaris in the upper jaw may be seen in the *primitive dental groove*, rising up from the mucus membrane lining its floor, in the form of a "*simple free granular papilla*," of an "ovoidal" shape—"the long diameter of which is antero-posterior." By the eighth week, another papilla, of a "rounded and granular form" is observable, between the "middle and anterior" curve of the ridge, on the floor of the same groove, which is the rudiment of the tem-

porary cuspidatus. "During the ninth week," the germs of the incisors—the central first, and soon after the lateral—make their appearance in the form also of mucous papillæ. During the tenth week "the sides of the groove before and behind the anterior molar papilla have been gradually approaching each other," and processes from its sides are sent off, from before and behind this germ, which meet and enclose it in a follicle. In the meantime a "similar follicle is gradually" forming around the cuspidatus germ. Towards the end of the tenth week, the papilla of the second or posterior temporary molaris shows itself.

The papillæ of the incisor teeth, which up to this time have advanced very slowly, now begin to increase more rapidly, and during the eleventh and twelfth weeks, processes are sent off from the outer and inner walls of the groove, forming for each a distinct follicle, and while the papillæ of the cuspidatus and first molaris are now undergoing little change, that of the second molaris is gradually increasing. During the thirteenth week a follicle is formed for it, and a gradual change takes place in the different papillæ; each begins now to assume a "particular shape,"—the incisors, that of the "future teeth,"—the cuspidati "become simple cones,"—the molares "become flattened transversely." The papillæ now "grow faster than the follicles, so that the former protrude from the mouths of the latter, while the depth of the latter varies directly as the length of the fangs of their future corresponding teeth." The mouths of the follicles, in the meantime, are becoming more developed, "so as to form opercula, which correspond in some measure with the shape of the crowns of the future teeth." Of these the incisor follicles have two—one anterior and one posterior,—the first larger than the latter; the cuspidati follicles have three—one external and two internal; the molar follicles, as many as there are eminences or tubercles upon the grinding surfaces of these teeth.

The outer and inner lips of the primitive dental groove have increased so much, that at the fourteenth week, they meet or apply themselves together in a "valvular manner," so as to give the papillæ the appearance of receding back into their follicles, and to be almost wholly hid by their opercula. The appearance and progress of the germs of the lower teeth and their follicles are al-

most precisely similar to those of the upper, though they do not appear at quite so early a period.

At the period last mentioned, the primitive dental groove "is situated on a higher level than at first," contains the germs and follicles of the ten temporary teeth, and "may now," says Mr. Good-sir, be "more properly denominated the *secondary dental groove*," for it is at about this time, that provision is made for the production of the ten anterior permanent teeth. It consists in the appearance of a depression of a crescent shape "immediately behind the inner opercula" of the follicle, first, of the central incisors, next of the laterals, then of the cuspidati, afterwards of the first bicuspidés and lastly of the second bicuspidés. The opercula, in the meantime close the mouths of the follicles, but without adhering, beginning with the central, then with the lateral, the cuspidati, and ending with the second molaris. The secondary groove is now soon closed by the approach and adhesion of its lips and walls, commencing from behind and proceeding forwards—forming the follicles into sacs—the papillæ into the pulps of the temporary teeth, "and the crescent-formed depressions" into "*cavities of reserve*," from which the pulps and sacs of the teeth of replacement are produced. The *primitive dental groove*, which, by this time, has extended itself back of the second temporary molaris, still "retains its original appearance;" it has a "greyish yellow colour," and its edges continue "smooth for a fortnight or three weeks longer" for the "development of the papilla and follicle" of the first permanent molaris.

The papillæ of the temporary teeth are now gradually moulded into the shape of the teeth they are destined to form; the pulps of the upper molares are perforated by three canals, and the lower by two, which penetrate to their centres. The primary base is divided into an equal number of secondary bases, from which the fangs of the future teeth are gradually developed. An intervening space is now formed between the pulps and the matrices or sacs, by the more rapid growth of the latter than the former, "in which is deposited a gelatinous granular substance, at first small in quantity, and adherent only to the proximal surfaces of the sacs, but ultimately, about the fifth month, closely and intimately attached to the whole interior of these organs, ex-

cept for a small space of equal breadth, all round the base of the pulps, which space retains the original grey colour of the inner membrane of the follicle, and as the primary base of the pulp becomes perforated by the canals formerly mentioned, the granular matter sends processes into them, which adhering to the sac, reserve the narrow space described above, between themselves and the secondary bases. These processes of granular matter do not meet across the canals, but disappear near their point of junction. The granular matter," although not adhering to the pulp, is exactly moulded to all its eminences and depressions.

The outer membrane of the sac, according to Mr. Goodsir, is supplied with blood from small twigs sent off by "each branch of the dental artery" at the fundus of its destined sac, and from the arteries of the gums, which inosculate with each other, and then ramify the "true" (inner) membrane.

The follicle of the first permanent molaris closes about this time, and has "granular matter deposited in its sac," and by the non-adhesion of the walls of the secondary groove, a cavity appears below the sac of this tooth, and from the lining mucus membrane, the second and third molar teeth derive their origin.

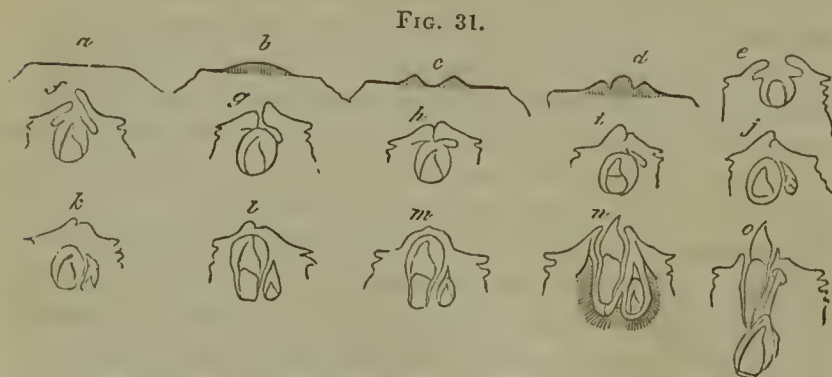
But previously to this period, the apices and eminences of the temporary teeth have become vascular and begin to ossify. And simultaneously with this process, the inner surface of the granular matter is absorbed, and after a while becomes so thin as to render the subjacent vascularity apparent. This goes on, and by the time an ossific layer has formed over the whole surface of the pulp and reached its base, no remains of it are left.

The cavities of reserve have been gradually receding and assuming a position behind the temporary teeth, the distal extremities of the anterior ones begin to distend about the fifth month, and it is here that the germs of the teeth of replacement first appear, and are indicated by a bulging up or folding of this portion of these cavities. They soon acquire the appearance of dental pulps, and the mouths of these cavities gradually become obliterated.

By the sixth month bony septa have formed across the alveolar groove, and niches are now formed on the "posterior walls of

the alveoli" for the sacs of the permanent teeth. The sac of the first permanent molaris remains up to the eighth, and even the ninth month, imbedded in the maxillary tuberosity. The roots of the temporary incisors, at or a little before birth, begin to be formed, and "in the accomplishment of which," says Mr. Goodsir, "three cotemporaneous actions are employed, viz: the lengthening of the pulp; the deposition of tooth substance upon it; and the adhesion of the latter of that portion of the inner sac which is opposite to it." About the time the central incisors begin to appear through the gum, "the jaw has lengthened so much, that the" first permanent molaris begins to assume its proper "position in the posterior part of the alveolar arch." The sacs of the permanent teeth continue to recede during the advance of the temporary teeth and "their sockets to their perfect state," and to "insinuate themselves" "between the sacs of the former" until "they are only connected by their proximal extremities," through the alveolo-dental foramina or *itinera dentium* of Delabarre.

The following diagram, taken from Goodsir, exhibits at one view the origin and progress of the formation of a temporary and its corresponding permanent tooth.



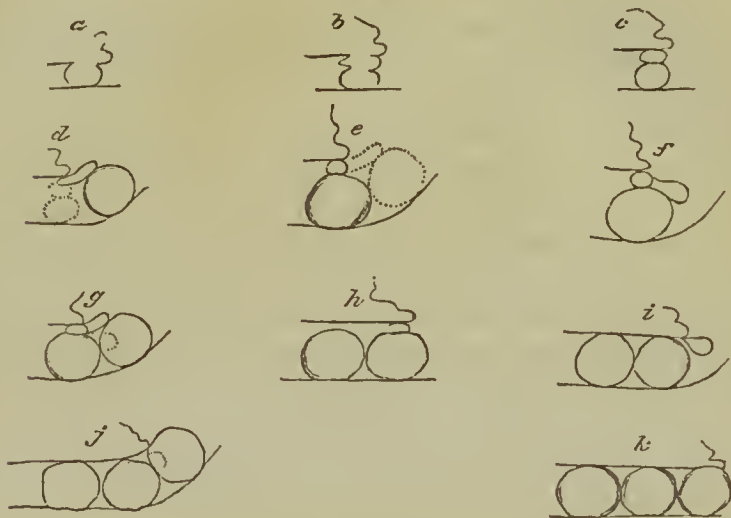
The vessels which go to the sacs of the permanent teeth are derived first from the gums, but they ultimately receive vessels

FIG. 31. *a* Mucus membrane; *b* Mucus membrane with a granular mass deposited in it; *c* The primitive dental groove; *d* A papilla on the floor of the groove; *e* The papilla inclosed in a follicle, and the secondary dental groove forming; *f* The papilla assuming the shape of a pulp, the opercula forming, and a depression for a reserve cavity behind the inner operculum; *g* The papilla become a pulp, the fol-

from the temporary sacs, which, uniting with the others, eventually retire into permanent dental canals.

The progress of the formation of the three molar teeth, will be seen by the following diagram copied from Mr. Goodsir.

FIG. 32.



The cavity of reserve, behind the first permanent molaris, begins to lengthen about the seventh or eighth month, a papilla soon

forms a sac by the adhesion of the lips of the opercula and the secondary dental groove in the act of closing; *h* The secondary groove adherent, except behind the inner operculum, where it has left a shut cavity of reserve for the formation of the pulp and sac of the permanent tooth; *i* The last change more complete by the deposition of the granular body, deposition of tooth substance commencing; *j* The cavity of reserve receding, its bottom, in which the pulp is forming dilating; *k* The cavity of reserve becoming a sac with a pulp at its bottom, and further removed from the surface of the gums. The temporary tooth covered with a layer of bone, and the granular substance absorbed; *l* The temporary tooth acquiring its fang, and approaching the surface of the gums; *m* Root of the temporary tooth longer, and its sac touching the surface of the gum; *n* Eruption of temporary tooth, its sac again a follicle, and the permanent receding further from the surface of the gum; *o* Completion of temporary tooth, free portion of sac become the vascular margin of the gum, and the permanent sac connected by a chord passing through the alveolo-dental canal or foramen.

FIG. 32. *a* The non-adherent portion of the primitive dental groove; *b* The papilla and follicle of the first molaris on the floor of the non-adherent portion, now become a portion of the secondary groove; *c* The papilla a pulp, and the follicle a

appears in its fundus, it then contracts and separates from the remainder of the cavity, by which means a new sac is formed, that of the second permanent molaris. As the jaw increases in length, it falls downwards and forwards. The papillæ of the wisdom teeth (*dens sapientiæ*) form in the remaining portion of the cavities of reserve, which in the upper jaw occupies the maxillary tuberosity, and in the lower, the base of the coronoid processes, which places, says Goodsir, they do not leave until the nineteenth or twentieth year.

Having now presented a brief outline of the observations of Goodsir on the origin and early stages of the formation of the teeth, I shall conclude this part of the subject by simply stating, that the ossification of a tooth proceeds from the exterior surface inwardly, that layer after layer of bone, one within the other, is formed, until nothing remains but a small residuum of the pulp, situated within the proper dental cavity, whose parietes are lined with a delicate membrane, upon which the vessels and nerves ramify before entering the osseous structure of the organ.

As yet, the origin and formation of the pulps and sacs of the teeth only, have been considered, I shall now proceed to offer a few remarks on the formation of the enamel.

OF THE FORMATION OF THE ENAMEL OF THE TEETH.

The opinion of most writers upon this subject is, that the enamel is a deposition from the inner membrane of the dental sac; that this, after the surface of the pulp of the tooth has ossified, pours out or discharges upon it a thick fluid, which soon condenses, assuming at first a chalky appearance, and afterwards,

sac, and the lips of the secondary groove adhering, so that the latter has become the posterior or great cavity of reserve; *d* The sac of the first molar increased in size, advancing into the coronoid process or maxillary tuberosity, and the cavity of reserve lengthened; *e* The sac of the first molar returned by the same path to its former position, and the cavity of reserve shortened; *f* The cavity of reserve sending backwards the sac of the second molaris; *g* The sac of the second molaris advanced into the coronoid process or the maxillary tuberosity; *h* The second molar sac returned, and the cavity of reserve shortened; *i* The cavity of reserve sending off the sac and pulp of the wisdom tooth; *j* The sac of the wisdom tooth advanced into the coronoid process or maxillary tuberosity; *k* The sac of the wisdom tooth returned to the extremity of the dental range.

by a process somewhat similar to crystalization, attains the glossy-like hardness by which it is characterized. The author was for a long time of this opinion, but recent observations, strengthened by a perusal of the thesis of RASEHKOW on this subject, have led him to believe it erroneous.

The gelatinous granular substance mentioned by Goodsir, and called by Raschkow the adamantine organ, situated between the follicle and tooth germ, the latter of which it invests, at first loosely, but afterwards more closely, moulding itself to the pulp, there is good reason to believe, is destined for the formation of the enamel. It is represented by the last named author as forming a "globular nucleus" between the follicle and dental germ at a very early stage of the growth of the latter, with a bulging externally, and presenting a parenchymatous appearance internally; but it gradually exhibits angular granulations, held together by "filaments of cellular tissue," resembling "a kind of actinenchyma, such as may be seen in plants." It was the discovery of this granular substance, first in dissecting the jaws of a pig, and afterwards a human foetus of about the fourth month, that first induced me to suppose the generally received doctrine of the formation of the enamel to be incorrect. It is at first, as represented by Raschkow and Goodsir, disconnected from the dental germ, surrounded by fluid, bearing a striking resemblance to the liquor amnii, but is gradually transformed into a membrane, and as ossification commences in the pulp, attaches itself to it, and adheres with considerable tenacity.

It was no doubt the discovery of this that led Delabarre to suppose the enamel an integral part of the tooth and "proceeding from the dental embryo," for he speaks of the formation of this outer coating of the teeth as being produced by an immense number of small exhalant vessels, which formed a "sort of imperceptible velvet." Into these he supposed the phosphate of lime was deposited, and in such a way as not to destroy their organic sensibility.

Raschkow says, "The dental germ, in advancing further and further into the dental follicle, makes first only a slight impression

on the globular mass of the enamel organ, but this impress is rendered gradually deeper as the growth of the germ proceeds. When the germ has penetrated further into the hollow thus made, it appears narrower towards the base, and thicker under the apex, and is enclosed around on every side by the parenchyma of the enamel-organ, which thus assumes the appearance of a hood, covering the dental germ when advanced in its development, and capable of being separated from it without difficulty, and without injury, either by the compressor, or in any other manner by being placed under water." He also represents it as being disconnected from the dental capsule, except at the coronal portion, where it seemed to be united by some loose vessels; it is thus that he accounts for the numerous capillaries which pervade the parenchyma of the organ; and from this, he assumes that while the dental germ has its origin from the extremity of the sac next the root, the enamel-organ originates from the opposite or coronal extremity, and that "arising at opposite points," they "approach each other, are adapted together, and both contribute to the production of the tooth."

The enamel organ having adapted itself to the dental pulp, Raschkow describes a "peculiar organ on its inner surface, consisting of short uniform fibres placed perpendicularly" "to the cavity, and forming as it were, a silky lining" to it, which in a transverse section of the enamel-organ, may be "clearly seen and can be accurately distinguished from the other stellated parenchyma of the substance" which he designates the enamel-pulp.

According to this author, "this stratum of fibres" originate in "the transformation of the pulp of the enamel," with which it is for a time connected, but afterwards it separates from it so as only to adhere by "a few filaments of cellular tissue, and becomes a genuine membrane;" which, on account of the function it performs, he styles the enamel membrane. "Its inner surface," he says, "consists of hexangular, nearly uniform corpuscles, visible only through a magnifying glass, towards the centre of each of which is a round eminence. These corpuscles are nothing more than the ends of short fibres, of which the whole membrane is composed, and which, being pressed together, assume

freely the hexangular form." These corpuseules he describes as being disposed in regular series, and corresponding with the arrangement of the enamel fibres.

He regards each of these fibres as an excretory duct or gland, whose peculiar function it is to secrete the "enamel fibre corresponding to it." Immediately after the commencement of the ossification of the dental pulp, each one of these fibres, with its inner extremity placed upon the now forming subjacent bone, begins to secrete the earthy salts of which this substance is chiefly composed. And while this is going on, an organic lymph, says Raschkow, seems to be secreted from the parenchyma of the enamel-membrane which penetrates between the individual fibres, and renders their whole substance soft. This, he thinks, by means of a "chemico-organic-process," afterwards combines with the earthy substances, and forms the animal base of the enamel.

It has been shown by Raschkow, that the dental pulp is invested by a very delicate membrane, which he denominates the *præformative membrane*, and there is every reason to believe, that this constitutes the bond of union which exists between the enamel fibres and the bone of the tooth.

Admitting this theory of the formation of the enamel to be correct, and that it is, hardly a doubt now remains, the "frame-work of animal tissue," spoken of by Nasmyth in his memoir presented to the Geological Section of the British Association, August, 1839, as entering into the composition of this substance, is readily accounted for. In no other way, except the theory of Delabarre be correct, and this is by far the most plausible, can its presence be satisfactorily explained.

Of the manner of the formation of the cementum, which is the last to appear of the dental constituents, nothing positive is known. Raschkow conjectures that it is probably produced by the remains of the enamel-pulp, but as it cannot be detected on the crowns of the human teeth, except in very young subjects, it is most likely secreted by the dental periosteum.

CHAPTER EIGHTH.

FIRST DENTITION.

THE exterior of the pulps of the temporary teeth, as has been shown, are ossified and coated with enamel at birth, and although at about this period the roots of the incisors begin to be formed, yet they all still occupy their bony cells in the alveolar ridge. But, as the time approaches when the system will require a diet better suited to the support of its increased energies than milk, the one on which it has hitherto subsisted, nature, is if conscious of the change that is about to take place, calls into action certain agents, by which openings are made in the alveolar cells and gums, through which, in obedience to an established law, the little gems, sparkling with whiteness, gradually and slowly emerge, pair after pair, until the pearly arches are completed, to answer the demands of increasing wants, and to assist in the articulation of those lisping accents, by which the child's early wishes are made known.

Dentition is divided by Goodsir into three stages, to wit: the *follicular*, the *sacular*, and the *eruptive*. The two first have already been considered, and it now only remains to treat of the last.

ERUPTION OF THE TEMPORARY TEETH.

Various opinions have been advanced with regard to the manner in which the passage of a tooth from its alveolar cell through the gum is effected. Some suppose that it is the result of the prolongation of the pulp for the formation of the root; others, that it is a consequence of the moulding of the alveolus around the latter, as it is formed. Some believe that the opening through

the gum is made by the pressure or mechanical action of the coronal extremity of the advancing tooth; others, and with by far more plausibility of reason, that it is the result of the action of absorbent vessels.

That able physiologist and learned dentist, Delabarre, has advanced a most ingenious theory upon the subject. He believes that the passage of a tooth through the gum, or rather its escape from its matrix, is effected in precisely the same manner as is the birth of a child. He regards the sac as the chief agent, and believes that it is by the retraction of this upon the neck of the tooth, that the tooth is raised from the socket towards the orifice of the matrix, and ultimately brought to a level of the gums.

This is the most rational theory that has been advanced; it explains, upon principles of sound philosophy, this most wonderful and curious operation of the animal economy. It is difficult to imagine how the elongation of the pulp or the moulding of the alveolar walls to it can have any agency in raising or depressing the tooth through the gums. If the elongation of the pulp commenced before the crown of the tooth had made any advance toward the gums, it would at once come in contact with the floor of the alveolus, and in its soft and yielding condition, be caused to assume a configuration different from that presented by the root of a naturally developed tooth. The crown of the tooth, therefore, must make some progress toward the gums, before the elongation of its pulp can commence, and it is difficult to conceive how this can be effected, if it is not, as Delabarre supposes, by the contraction of the fibres of its sac.

The ossification of the exterior of the root of the tooth, proceeds nearly as fast as the elongation of its pulp for its formation. Commencing at the neck, it proceeds inwards and downwards, until it reaches the extremity, and nothing remains but a small canal running through the centre, from its apex to the cavity in the crown, through which the dental vessels and nerves pass. The alveolus, in the mean time, deepens, approaches, and closely embraces it.

As soon as the edge or the coronal extremity of the tooth comes through the gum, the sac assumes its primitive follicular

condition, but still connected with the neck of the tooth, it continues to contract until the whole of the crown has passed through the gums.

The period of the eruption of the temporary teeth is variable, depending probably upon the state of the constitutional health of the child. The central incisors generally make their appearance between the fifth and eighth months of infancy, and the whole process of dentition is usually completed between the twenty-fourth and the thirty-fifth months.

According to Mr. Thomas Bell, the four central incisors appear at from five to eight months after birth; the four lateral, from seven to ten; the four anterior molares, from twelve to sixteen; the cuspidati, from fourteen to twenty; and the four posterior molares, from eighteen to thirty-six.

My own observations on this point, and it is one to which I have paid considerable attention, leads me to believe that Mr. Bell is somewhat in error in regard to these periods, especially those for the appearance of the posterior molares. No general rule, it is true, can be laid down, to which there will not be many exceptions; but had he stated from twenty-four, instead of from eighteen to thirty-six months, he would have been much nearer correct. They do sometimes, it cannot be denied, appear as early as the eighteenth month, or even sixteenth, yet it rarely happens that they show themselves before the twenty-fourth month.

There is sometimes an extraordinary tardiness of action in the eruption of the temporary teeth. There is a case of a child, somewhere on record, that did not get any of its teeth until it was ten years old; and LÉFOULON states that he saw a young girl of seven years of age, whose inferior incisors had not appeared. Several cases have come under the observation of the author in which dentition did not commence until the fifteenth, and one not until the twentieth month. On the other hand, there are cases of precocity of action in the eruption of the teeth equally as remarkable, as for example, when the two lower incisors are cut at birth. Louis XIV. was born with four teeth, and Polydorus Virgilius mentions a child that was born with six.

Other similar cases are on record, and there are few physicians or dentists who have been in practice ten or fifteen years, who have not met with them.

In speaking of these early productions, Mr. Fox says, "As they only have a weak attachment to the gums, they soon get loose, producing a considerable inflammation in the mouth of the child, as well as occasioning considerable inconvenience to the mother. It is, therefore, advisable to extract them immediately; for they can never come to perfection." In this opinion, I am compelled to differ with Mr. Fox, for their attachment is not always, as he supposes, confined to the gums; their roots are sometimes securely fixed in sockets in the jaw. When this is the case, they do not occasion any inconvenience, and their extraction would be highly improper. It is always better, therefore, to wait until there is some positive indication that such an operation is necessary, before it is performed.

In the eruption of the teeth, nearly the same order is followed that is observed in their ossification. The central incisors appear first, then the lateral, next the first molares, afterwards the cuspidati, and lastly, the second and third molares.

The lower teeth, in their eruption, are said usually to precede the upper about two or three months, but the upper appear first nearly as often as do the lower.

THE EFFECTS WHICH SOMETIMES RESULT FROM FIRST DENTITION.

When we consider the early age at which first dentition commences, and the fragile and irritable state of the system, it will not appear at all wonderful that it should so frequently suffer from the efforts that are made by it for the liberation of these organs from the bony cells and superincumbent gums, in which they are confined. The constitution, at this tender period of life, often receives a shock from which it never recovers; and the seeds of many chronic diseases are caused to germinate, which otherwise, in all probability, would have forever remained dormant.

This is generally regarded as the most critical period of life, and has often proved one of bereavement and sorrow. The whole process is sometimes completed without inconvenience, but

at other times, it is attended with so much pain and irritation that the most alarming and complicated forms of disease follow.

The irritation that arises from first dentition is caused by the pressure that the teeth make upon the gums in forcing their way out, and varies in extent, according to the previous health and temperament of the child. When the absorption of the gums keeps pace with the growth of the teeth, the pressure is scarcely, or not at all, sensible; but when this is not the case, it becomes more or less great, in proportion as the growth of the one outstrips the absorption of the other.

"This pressure," Dr. Good observes, "is not uniformly exerted through the whole course of teething, but is divided into distinct periods or stages, as though the vital or instinctive principal, which is what we mean by nature, becomes exhausted by a certain extent of action, and requires rest and a state of intermission.

"The first or active stage of teething is usually about the third or fourth month of infancy, and constitutes what is called breeding the teeth, or the conversion of the pulpy rudiment buried in the gums, and formed during foetal life, into a solid material, which, at the same time, shoots downward, and gives to every tooth a neck or fang."

During the period of teething, the child is restless and fretful, but its paroxysms of suffering are periodical, and seldom last more than two or three hours at a time; whereas, were the pressure of the teeth upon the gums uniform and constant, there would be no such intermissions as are here described. The repose thus afforded, enables the system somewhat to recover from the exhaustion occasioned by each preceding paroxysm, otherwise, its excited energies would soon be worn out, and the child fall a victim to the continued intensity of its sufferings.

Dr. Good, however, is mistaken, when he supposes that the pulpy rudiment begins to be converted into a solid material, at the third or fourth month of infancy, when, what he calls the first or active stage of teething, commences. The bony part of the crowns of the deciduous teeth is perfectly formed at birth, though their enamel is not completed until a later period. The clonga-

tion of the pulp commences about the time mentioned by Dr. Good, and this seems to have been confounded by him with its ossification.

When the irritation is merely local, it is generally of short duration, subsiding as soon as the teeth are freed. In such cases, the only unpleasant symptoms are a slight tenderness and tumefaction of the gums, and an increased secretion of saliva. This secretion, however, is very beneficial, since it tends to diminish the action in the vessels of the inflamed parts. But when the irritation is so severe that it affects the functional operations of other parts of the system, febrile symptoms of a general, and of a more or less aggravated character, supervene, and are attended with drowsiness, diarrhœa, and not unfrequently, with various cutaneous eruptions on different parts of the body. Sometimes, these consist of what is called the red gum; and at other times, of pustules, which are at first filled with a limpid fluid; but afterwards, become purulent. The former of these appears on the neck and face: the latter is not confined to any particular part of the body, but is either thinly scattered over its whole surface, or appears in small patches.

There is also another kind of eruption that occasionally follows irritation from first dentition. It breaks out about the mouth, the cheeks, and forehead, and sometimes extends to the scalp, which in a short time becomes dried up and covered with disagreeable scabs, which soon drop off to be succeeded by others.

These eruptions are generally regarded as indications of the substitution of a milder for a more aggravated form of disease, and should not, therefore, be too hastily suppressed.

To these symptoms, we may add: cough, spasms of the muscles of the face, particularly of those about the mouth, and, when the diarrhœa is so copious that it occasions great emaciation, convulsions, that frequently cause the death of the patient.

Thus far, we have merely glanced at a few of the effects of first dentition. To attempt a description of all, would involve the enumeration of the whole catalogue of diseases peculiar to infancy, which, as they more properly belong to another branch of medi-

cine, I shall here neither stop to detail, nor point out minutely, their curative indications.

I cannot, however, dismiss this part of my subject without briefly noticing some objections that have been urged by many practitioners, to an operation which is simple and harmless, and at the same time very efficient, in removing one of the most frequent causes of these complaints. I allude to the lancing of the gums.

There exists much causeless opposition to this practice, and the objections of its opponents, though they have been shown to be groundless, are again and again reiterated, and, to one unacquainted with the subject, not without some seeming plausibility.

By some it is objected, that, though the opening of the gums may afford temporary relief, yet the cicatrix, formed by the healing of the wound, forms a greater obstacle to the exit of the tooth, than the parts, when left to themselves, ever do. Now, any one who is at all conversant with the subject, knows, that in four cases out of five, where the operation is necessary, the teeth are so far advanced, that on the collapsing of the edges of the wound, their crowns immediately protrude: and even when the wound does unite, the soft and spongy cicatrix, much more readily yields to the action of the absorbents, than the unpunctured gums do.

Another objection is founded upon a supposition that the enamel, at this early period, is in a soft and amorphous state, and that consequently the teeth may be injured by contact with the knife. But, as the parts of the enamel that are exposed to the instrument usually attain their greatest hardness before this operation is required, this objection is without foundation. In short, I have never known any injury to result from it, either in my own practice, or in that of others; nor can those that are opposed to it, bring facts to support their opposition.

This practice often succeeds after all others have failed. I have frequently known children, after having suffered the greatest agony for days and weeks, and until they had become reduced to mere skeletons, obtain immediate relief without the aid of any other remedy than this, which at once removes the cause, whereas,

others only counteract the effects of suffering, and can therefore, only be considered as palliatives that may assist nature in her struggle with disease, but cannot always prevent her from sinking in the contest.

OF THE IMPORTANCE OF THE PRESERVATION OF THE TEMPORARY TEETH.

Although it may seem somewhat out of place, to treat of this subject here, yet in consequence of its close connection with the one which immediately precedes it, the author is of the opinion that it is better to do so, than to defer its consideration for a subsequent part of the work.

Many suppose, that inasmuch as the temporary teeth are intended to subserve the wants of the body, only for a short time, and are then to be succeeded by a stronger and better set, it is of little consequence whether they remain until they are removed by the operations of the economy, to give place to others, or are lost a year or two earlier. But this is a great error; and it is one that has been productive of much mischief.

By the decay of a temporary tooth, its lining membrane is often exposed, and in consequence becomes inflamed, giving rise to pain, and oftentimes to alveolar abscess and necrosis, and exfoliation of the alveolar processes, and sometimes to considerable portions of the jaw bone. The alveolar cells and crowns of the permanent teeth are in this way sometimes destroyed. This however does not often happen, but the latter always suffer injury from disease in the sockets of the temporary teeth, for it is impossible for a morbid action to exist here for any great length of time, without impairing the functions of the parts concerned in the production of the secondary teeth, which are situated immediately behind and beneath the roots of the primary.

Inflammation of the alveolo-dental periosteum of a temporary tooth and the gums, may, by communicating a morbid heat to the sac of the permanent one behind or beneath it, be productive of much injury to the new tooth. It may interrupt or impair the process of ossification, by causing the calcareous ingredients that enter into the composition of these organs, to be secreted in too

small quantity; and it may also cause the fluid of the sac, in the midst of which the new tooth is situated, to become acrid or acidulated, and to corrode the enamel, but this last effect is produced more frequently by general than by local disease.

The decay and premature loss of the temporary teeth, constitutes one of the most frequent causes of irregularity in the arrangement of the permanent, and if for no other reason than the prevention of this, their preservation, if possible, should be secured until they are removed by the economy to give place to their successors.

Besides the local effects that are produced by disease in the temporary teeth, the functional operations of other parts, and sometimes those of the whole system, become, in consequence, more or less deranged. It is well known that an unhealthy condition of the permanent teeth often gives rise to general or constitutional disease, and the system, at this young and tender age, is certainly more susceptible to morbid impressions than it is after all the parts of the body have acquired the full vigor of maturity.

Most of the diseases that attack the temporary teeth are the result of inattention to their cleanliness. The particles of food and other extraneous matter that lodge between the teeth and in their interstices, and along the edges of the gums, if permitted to remain, soon undergo a chemical decomposition, and become a source of irritation to the latter, vitiating the secretions of the mouth, and rendering them prejudicial to the health of the former.

The temporary teeth, from these causes, are often soon involved in extensive caries, subjecting the little sufferer to the most torturing pain, and depriving it of the first set, long before the time for the appearance of the second has arrived. Some teeth are more susceptible to the action of chemical agents than others, and are consequently more liable to disease. Teeth that are of a hard and firm texture are not easily affected, but those that are soft and chalky are readily acted upon by the fluids of the mouth when in an impure and vitiated condition, and the greatest care and attention is necessary to preserve them even for the short period their presence is required.

As the decay of the teeth is dependent upon the presence of vitiated, acrid and corrosive matter, the means for its prevention are obvious. It consists in frequent and thorough cleanliness, which, to be effectual, should be commenced as soon as the first teeth appear. Dr. L. S. Parmly, a dentist of upwards of thirty years experience, and a close and attentive observer, recommends the rubbing of the gums of the infant from birth to the appearance of all the teeth, with the finger of the mother or nurse, for the purpose of giving them a firm texture. He also recommends the cleaning of the first teeth as soon as they appear, with a brush and water, and with waxed floss silk, morning and evening, and after each meal. The latter he directs to be passed between the teeth and moved up and down between them and the free edges of the gums, for the purpose of removing all accumulations of impure or vitiated matter.

If, notwithstanding the regular and thorough use of these means, stains or discolorations should come upon the teeth near the gums, as they often do, Dr. Parmly recommends for their removal, the daily employment of an argillaceous tooth-polisher, so formed as to be readily applied to the surfaces of the teeth. Powders are generally employed for the accomplishment of this object, but they, on many accounts, are objectionable, and should never be used when the gums are inflamed and swollen, for when in this condition, they get between them and the necks of the teeth, increasing the irritation, and thus, by rendering the secretions of the mouth still more vitiated and viscid, hasten the destruction of the teeth. And great precaution is necessary to prevent them from doing this, even when the gums are healthy, and for this reason, the argillaceous tooth-polisher, recommended by Dr. Parmly, is preferable to powders under any circumstances. But when this cannot be had, and it becomes necessary to have recourse to the latter, great care should be taken to procure such as will not exert a chemical action upon the teeth.

If parents and guardians would pay more attention to this subject, the services of the dentist would be much less frequently required. The importance of cleanliness and other attention to

the teeth of children cannot be too strongly urged, as by it, a vast amount of disease and suffering in after life, may be saved.

The following appropriate remarks, although not applying exclusively to the teeth of first dentition, are quoted from Dr. Eleazar Parmly's notes to Dr. Brown's *Dentologia*. The high reputation of the author as a dental practitioner, and his extensive experience, entitle them to more than ordinary respect.

He says, "This is a subject which demands the attention of parents, and those who are entrusted with the care of children. It should be the first object of every person so situated, to habituate children to clean their teeth at least twice a day, and when this practice has been once adopted, it will be continued as a matter of course. Besides this, from the age of six to twelve years, in particular, a dentist should be consulted from three to four times a year, and at a later period, once or twice, for the purpose of examining the teeth, and counteracting, by the timely removal of such causes as may produce disease, any mischief which is likely to take place.

"In London and Paris, and I believe in all the larger cities of Europe, the principal academies and boarding schools are regularly attended by dentists, for the purpose of having the children's teeth examined, and of performing such operations as they may require, when necessary. I should be glad to see this plan more universally adopted in our own cities, for I am convinced the advantages arising from it are incalculable; for, if proper care and attention be not paid during the time the teeth are shedding, a countenance, however naturally beautiful, may, in consequence, be totally disfigured; and it frequently happens, that an unpleasing countenance, although united to an amiable mind, produces a dislike that is not easily overcome. 'It is, therefore,' says Mr. Murphy, 'a duty incumbent on parents, and those who have the care and education of youth, while they do justice to their minds, not to overlook their personal advantages.'"

And on the cleanliness necessary to the preservation of the first denture, Mr. Murphy thus observes, "As soon as the teeth of a child are completed, they should be brushed twice, or, at least, once a day, with a soft brush and water. When children

are thus early familiarized to the healthy and necessary custom of brushing the teeth, it becomes a fixed habit, and they find it ever afterwards absolutely essential to their comfort. In winter, or in cold weather, the water used in brushing the teeth should be tepid. It is quite unnecessary to use any kind of powder to the first teeth of children."

Caries of the temporary molares may be arrested by proper and timely treatment, which consists in the removal of the disease and filling the cavity with gold. But neither the operation of filing nor plugging should be resorted to after the destruction of their roots has commenced. The pressure necessary to be employed in the latter operation is too great to be borne with impunity by the deciduous incisors and cuspidati. Filing, therefore, although at one time thought to be of rather questionable propriety, is the appropriate and proper remedy for caries on the lateral surfaces of these teeth. It will effectually secure their preservation, if they are subsequently kept constantly clean, until, by the destruction of their roots, they loosen and drop out; but the operation should be performed early, while they are firmly and securely fixed in their sockets.

The temporary teeth generally decay more readily and rapidly than the permanent ones do; but the former are seldom subject to so severe and excruciating pain as are the latter. But when their lining membrane becomes exposed, they are often exceedingly painful, and for the relief of which anodynes should be applied. Laudanum or spirits of camphor will generally afford relief. Arsenic is a more certain remedy, but this should only be applied in very small quantity, and with great caution. The thirtieth or fortieth part of a grain, with an equal quantity of the sulphate of morphia, is amply sufficient, and after it has been applied, the cavity in the tooth should be carefully and securely sealed with wax or gum mastic. When the pain is occasioned, as is often the case, by inflammation of the alveolo-dental membrane, leeches should be applied to the gum of the aching tooth, and if they fail to afford relief, the faulty organ should at once be extracted; for, it is better to risk the consequences of its premature loss,

than the injury that would be likely to result from its retention in the mouth.

The temporary teeth, however, should, if possible, be retained, until, from the spontaneous destruction of their fangs, they drop out of themselves; nor should their extraction ever be determined on, unless required by some pressing emergency; for their premature loss generally occasions a contraction in the span of the alveolar arch, and a consequent irregularity in the arrangement of the permanent teeth.

CHAPTER NINTH.

SECOND DENTITION.

THERE is no operation of the animal economy more singular or interesting than that which is exhibited in the gradual destruction of the roots of the temporary, and in the growth and dentition of the permanent teeth. And the time of life when this occurs, constitutes an important epoch in the history of every individual.

During childhood, the alveolar arches form only about the half of a circle, but by a gradual elongation of the jaws they ultimately, at adult age, form nearly the half of an ellipsis, so that the number of teeth required to fill them at the one period, is but little more than half the number required to fill them at the other.

Moreover, the food of children is principally vegetables, which require but little mastication to prepare them for the stomach, whereas that of adults consists of an almost equal additional portion of animal substances, which, owing to the greater cohesion of their particles, require a more numerous and substantial set of instruments for their trituration.

So admirable is the economy of second dentition, that even before the shedding of the primitive teeth commences, and as soon as the jaws are sufficiently enlarged, four of the second set, one on each side, in each of the maxillary arches, make their appearance. Consequently, the number of teeth, after the completion of the first set, is never, unless by accident or disease, at all diminished.

The rudiments of the permanent incisors and cuspidati have attained their full size at birth, and each is situated immediately behind its corresponding temporary tooth.

The permanent, with the exception of the bicuspidates, are considerably larger than the temporary teeth, and during the time of their formation, are situated in the segment of a much smaller

circle, which occasions great irregularity in their arrangement. But before the shedding of the first begins, the latter, by an increase in the depth of the jaws, and the development of the alveolar processes, are brought forward, so, that at about the fifth year, they are situated immediately below in the lower and nearly above in the upper maxilla, occupying places in the alveolar border, corresponding in depth to the length of their respective roots.

By this arrangement the permanent teeth occupy the smallest possible space in the jaws. The central incisors and cuspidati nearly fill the anterior part of the arch, while the lateral incisors are thrown back behind and partly between them.

The following concise description of the relative position of the teeth, at the fifth year after birth, is given by Mr. Bell. "In the upper jaw, the central incisors are situated, immediately beneath the nose, the lateral incisors thrown back behind the points of the cuspidati; and the base of the latter scarcely a quarter of an inch below the orbit. In the lower jaw, the cuspidati are placed at the very base of the bone, with only a thin layer beneath them, but the crowding is much less considerable than in the upper jaw, from the smaller comparative size of the incisors.

"The permanent central incisors of the lower jaw, are placed immediately beneath the temporary, with their points directed a little backwards, behind the partially absorbed roots of the latter. The lateral incisor, not yet so far advanced, is placed deeper in the jaw, and instead of being immediately beneath the temporary, is situated with its point between the roots of this and the cuspidatus. The permanent cuspidatus is still very deeply imbedded in the bone, with its point resting between the roots of the temporary cuspidatus, and the first temporary molaris. The two spreading roots of the latter, encompass, as it were, within their span, the first bicuspid; and those of the second temporary molaris, in like manner, the second bicuspid. Nearly a similar arrangement is found to exist in the upper jaw, except that the teeth are altogether more crowded."

The exact position of each tooth, as well as the entire temporary set, is exhibited in the accompanying cut.

FIG. 33.



Before proceeding further with second dentition, it may be proper to offer a few remarks on the destruction of the roots and the shedding of the temporary teeth.

OF THE SHEDDING OF THE TEMPORARY TEETH.

Some very singular notions were entertained among the ancients concerning the temporary teeth. Many thought they never had roots, inasmuch as they were observed to be wanting when they dropt out; others, that the crowns were removed, and that the roots remained and afterwards grew and became the permanent teeth.

This most wonderful operation of the economy is effected in accordance with an established law, but there exists, among physiologists, some difference of opinion with regard to the manner in which it is brought about. To the absorbents, most writers ascribe the agency of its accomplishment. Mr. Fox supposes, that as the new teeth begin to rise from their sockets, they come in contact with and press upon, first, the partition of bone intervening between them and the roots of the temporaries, and afterwards upon the roots themselves; and this pressure, he believes,

FIG. 33. A view of the superior and inferior maxillary bones of a child about four years old; with their exterior and outer walls removed, so as to show the crowns of the permanent teeth behind the roots of the temporary. The superior maxillary bones are separated at the medial line, and are about a quarter of an inch apart. Behind the second temporary, are seen the crowns of the first permanent teeth imbedded in the alveolar ridge.

induces their absorption. He afterwards, however, admits that pressure is not necessary to their absorption, as it sometimes takes place where there is none.

Mr. Hunter does not attempt to explain the manner of the destruction of the roots of the temporary teeth in any other way than by stating, that they decay off up to the gum. Fauchard and Bourdet attribute their removal to the action of a corrosive fluid, supplied for a special purpose. Bunon thinks they are worn away by the erupting teeth. Lecluse is of the opinion that when the process of their removal begins, their vessels cease to supply their nourishing juices, and that they are broken up by a species of maceration while Jourdain believes it is both by abrasion and corrosion.

Mr. Bell, as do indeed almost all recent writers, adopts the theory of Mr. Fox, that the destruction of the roots of the temporary teeth is the result of absorption. Laforgue, observing a fungiform or carneous substance behind the root of the temporary tooth, which, in fact, had been noticed by Bourdet, and supposed by him to exhale a fluid possessed of solvent qualities, gave it the name of absorbing apparel, and assigned to it the office of removing the root of the primary tooth.

Delabarre, who has treated this subject at greater length and apparently investigated it more closely, corroborates the views of Laforgue, and gives the following description of the manner of the formation and function of the carneous substance spoken of by this author as the absorbing apparel. "While the crown of the tooth of replacement," says Delabarre, "is only in formation, the exterior membrane of the matrix is simply crossed by some blood vessels; but as soon as it is completed, the capillaries are then developed in a very peculiar manner, and form a tissue as fine as cob-web; from this tissue the internal membrane, instead of continuing to be very delicate, and of a pale red colour, increase in thickness and assumes a redder hue. As was before said, it is at the instant in which commences the reaction of the coats of the matrix, that are conveyed from the gum to the neck of the tooth, that the plaiting of the vessels, that enter into their tissue, compose a body of a carneous appearance, whose absorbents extend their empire over all the surrounding parts; it is, therefore, the

dental matrix itself, that, after being dilated to serve as a protecting envelope to the tooth, is contracted to form not only this bud-like body which we find immediately below the milk tooth, at the instant in which it naturally falls out, and whose volume is necessarily augmented as odontocia gradually goes on; but also a carneous mass by which the whole is surrounded and whose thickness is the more remarkable as the organ that it envelopes is nearer its orifice."

After giving this description he asks, "is there a dissolving fluid that acts chemically on the surrounding parts, or do the absorbents, without any intermedial, destroy every thing that would obstruct the shooting up of the tooth?" In reply to this, he says, "Not possessing positive proof, suitable to guide me in the decision of this question, and finding those of others of little importance, I shall not attempt to answer them."

In pursuing the subject further, he states that the vessels of the temporary tooth often remain entire in the midst of this carneous substance, continue to convey their fluids to the central part of the tooth, whilst the calcareous ingredients and the gelatine have been removed, and that at other times they too are destroyed. And the conclusion to which he arrives, after a careful examination of the whole subject, is, that whether the earthy and animal parts of the root are removed by the absorbents of the carneous tubercle in question without any previous change, or whether they are decomposed by the chemical action of a fluid exhaled from it, they are ultimately carried back into the general circulating system.

In proof of the agency of the fleshy tubercle in the destruction of the roots of the temporary teeth, he mentions one fact that goes very far to establish it, and if his views be correct, will account for those cases which are occasionally met with, where one or more of the permanent teeth fail to appear. It is this: if this substance fails to be developed, or is destroyed by an injurious operation, the tooth often remains in its socket, and never makes its appearance. Cases of this kind have fallen under the notice of almost every practitioner.

In as few words as possible, I have given the views of this ingenious writer, on the subject under consideration, and although they do not seem to have attracted much attention from English writers, and are rejected by Mr. Bell, on the ground, as he says, but which I have never known to be the case, that the destruction of the root of the temporary frequently commences on a part "the most remote from the sac of the permanent tooth," I am disposed to believe them, for the most part, correct. As to the existence of the fleshy tubercles, there can be no question, and that it is through the agency of these that the roots of the temporary teeth are destroyed, seems more than probable. But whether it is through the agency of their absorbent vessels or a chemical fluid exhaled for the purpose, may not, as Delabarre says, be so easy to determine.

The change that takes place in the external membrane of the dental sac, as noticed by Delabarre, is observable, first on the peduncle or chord leading from it to the gum behind the temporary tooth. It here becomes thickened, about the time the root of the new tooth begins to form, and assumes a fleshy appearance, and it is here that the destruction of the surrounding bone commences, enlarging the alveolo-dental canal, and gradually removing the intervening bony partition, and finally the root of the temporary tooth. The agency of this thickened and fleshy condition of the exterior membrane of the dental capsules, in the removal of the roots of the temporary teeth, is rendered more conclusive by the fact, that, in those cases where the roots of the permanent teeth have become partially destroyed, the alveolo-dental periosteum had assumed a similar appearance. In the formation too of alveolar abscess, the tubercle at the extremity of the root presents a like aspect.

It oftentimes happens, that the root of a temporary tooth fails to be destroyed, and that the crown of the replacing organ comes through the gum in a wrong place. Whenever this happens, the carneous body is developed only beneath the parts through the opening of which the new tooth has appeared, and is not brought in contact with the bony partition between it and the root of the temporary.

The manner of the destruction of the roots of the temporary teeth has been a subject of close and critical enquiry with me for several years, and the more I have examined the subject, the more fully have I become convinced, that it is the result of the action of this fleshy tubercle upon them. And while its formation seems to be the result of the contraction of the dental sac and its appendage, for the purpose of effecting the eruption of the tooth, it is especially charged with the removal of every thing that would obstruct its passage.

In conclusion, it is only necessary to observe, that the temporary teeth are shed in the same order in which they at first appear. After one pair has been shed, a sufficient time usually elapses before the shedding of another, for those of the same class of the permanent set to come forward and take their place. Thus, the jaws are never deprived, unless from some other cause than the destruction of the roots of the temporary teeth, of more than two teeth in each jaw at any one time.

OF THE ERUPTION OF THE PERMANENT TEETH.

The irritation consequent upon the eruption of the permanent teeth, is usually very slight, and with the exception of the *dentis sapientiæ*, seldom occasions much inconvenience. This is owing to the fact, that when second dentition commences, the system has acquired so much vigor and strength, that it is not easily affected by slight morbid impressions, and that the gums offer comparatively little resistance to the exit of the teeth, for when the temporaries drop out, the others are generally so far advanced, as almost immediately to protrude. And even when this is not the case, the cicatrix that forms over the permanent tooth is usually of so spongy a texture, that it readily yields to the action of the absorbents. The process too, is more gradual, from six to eight years being required for its completion, while the dentition of the first teeth is accomplished in less than half that time.

Second dentition usually commences at about six or seven years after birth, and is generally completed, as far back as the second molares, by the twelfth or fourteenth year. The *dentis*

sapientiaë seldom appear before the eighteenth or twentieth year. The periods of the eruption of the adult teeth are, however, so variable, that it is impossible to state them with perfect accuracy. Sometimes the first permanent molares appear at four years, and the central incisors at five; at other times not before the ninth or tenth year.

But as it is of some importance that the periods of the eruption of the several classes of the permanent teeth should be known, I will state them with as much accuracy as possible.

First molares, from fifth to sixth year; central incisors, from sixth to eighth; lateral incisors, from seventh to ninth; first bicuspidates, ninth to tenth; second bicuspidates, tenth to eleventh and a half; cuspidati, eleventh to twelfth; second molares, twelfth to fourteenth; and the third molares (*dentes sapientiaë*), from eighteenth to twentieth.

OF THE ACCRETION OF THE JAWS.

As the rudiments of the temporary teeth increase in size, there is a corresponding increase in the maxillary bones, but during the earlier stages of the formation of the permanent teeth, their growth is not so manifest. But at about two and a half years after birth, they begin to elongate, and generally at the fifth year have acquired sufficient length to admit behind the second temporary molares, the first permanent ones. After the completion of first dentition, the part of the jaws within which this set of teeth is situated, augment in dimensions but very little. The increase after this time is chiefly confined to the back part of the jaw, between the second temporary molares and the coronoid processes. The anterior part of the jaws do, however, augment a little, although so inconsiderable in extent is the increase here, that some, and among whom are Hunter and Fox, have been induced to deny the fact. By the admeasurement of various jaws, at different ages, the writers just named have endeavoured to prove, that the larger size of the permanent than the temporary incisors, is not greater than the larger dimensions of the temporary molares than the bicuspidates, and that consequently no increase in this part of the jaw is necessary.

But a measurement of the same jaw, made after the first permanent molares have come through the gums, and after the dentition of all the teeth of replacement, will show that their calculations are not to be relied on.

M. Delabarre, in attempting to prove the incorrectness of these gentlemen's calculations, by a similar course of experiments, appears to have fallen into an opposite error, whence, it would seem, as is justly remarked by Mr. Bell: "That no comparison, instituted between the jaws of different individuals, can be relied on as conclusive." The only way by which we can arrive at the truth of the matter, is, by examining the same jaw at different ages, and comparing the several results. "This," says Mr. B., "I have repeatedly done, and have no hesitation in saying, that the ten anterior permanent teeth occupy a somewhat larger arch, than the temporary ones which preceded them had done."

The transverse and perpendicular dimensions of the anterior part of the jaws continue to augment until the completion of second dentition, and even during adolescence.

In alluding to the influence which the pressure of the teeth may exert in determining an increase of the anterior part of the jaws, Delabarre contends, that while it is impossible for there to be any immediate pressure of these organs, except at the time when they are forcing their way through the enlarged alveolo-dental canals, their contact at this period, gives rise to a mechanical increase; and he contends that previously to this period, the enlargement has been carried on by the liquor contained in the dental sacs. He argues therefore, that the jaws, besides the mode accretion resulting from nutrition, "have another peculiar to themselves," coinciding with the development of the dental sacs, and the quantity of fluid which they contain, as also with the manner of the arrangement of the crowns of the permanent teeth between such as may be in the circle, whether belonging to first or second dentition.

That the dimensions of the alvcolar arch may be increased by pressure upon the teeth from behind forwards, no one will deny, but to suppose the accretion of the jaws may be determined by the pressure of these organs against each other, or by the fluid contained in the dental sacs, would be to suppose that the law

that determines it in other bones, is inoperative here. In fact, to do this, would be attributing it rather to accident than to a natural operation of the economy.*

The elongation of the jaws produce a corresponding change in the form of the face. Thus, the face of a child is round, that of an adult is long and prominent.

The permanent incisors generally fill the space formerly occupied by the temporaries of the same class, and about one-half of that previously filled by the primitive cuspidati. The other half of this space, together with a moiety of that before taken up by the first temporary molares, is occupied by the permanent cuspidati.

The bicuspidates occupy larger spaces, by one-fifth or sixth, than those occupied by the remaining moieties of the first, and the whole of the second temporary molares.

Hence, it will be perceived, that the ten anterior permanent teeth occupy a somewhat larger space than that which was taken up by the temporary ones that preceded them, and that, were there no increase in the size of this portion of the arch, the uniformity of their arrangement would be more or less disturbed.

But there is not always an increase in the anterior part of the jaws; on the contrary, the premature loss of one or more of the temporary teeth, often occasions a contraction, that frequently causes much irregularity in the arrangement of the second set, and sometimes forces the first and second molares so far back, that the dentes sapientiæ are thrown against the coronoid processes, and thus, in many instances, such violent inflammation in

* The formation of the alveolar processes, and that of the teeth, take place according to different laws. The jaws grow and enlarge in conformity with the general laws which preside over the increase of the osseous system. The alveolar arches, at birth, are little more than one inch in length; at nine years of age, they are nearly two inches, and at the period of perfect growth, at least two inches and a half long. The depth of the lower jaw in the fœtus at the full time is the seventh, and in the adult the fifth of the whole height of the head. The teeth, on the contrary, uniformly appear with the breadth and thickness, only not the length, to which they will ever attain. In order that the development of these organs may take place in a regular manner, it is therefore necessary that a certain harmony be established between their sizes at different periods, and the alveolar edges of the jaws.—*Bourger's Anatomy*.

the muscles of this portion of the jaw is produced, that the extraction of these latter teeth becomes unavoidable.

About the third year, the jaws are more rapidly elongated, in order that the first permanent molars, which are at this time slowly advancing, may be accommodated behind the second temporary molars. This elongation of the jaws continues until the dental arches have become sufficiently enlarged for the reception of the whole of the permanent teeth.

It sometimes happens that the jaws in their accretion are badly developed, and have a faulty configuration. This may occur with one or both jaws. The alveolar arch is sometimes too narrow, having a compressed appearance, and projecting so far forward as to prevent the upper lip from covering the front teeth, and thus imparting to the individual an exceedingly disagreeable appearance. In cases of this sort, the roof of the mouth, instead of presenting an oval arch, forms an irregular triangle. At other times the alveolar arch is too wide, causing the teeth to be separated from each other, and the roof of the mouth to present a flattened appearance.

Similar defects are met with in the configuration of the lower jaw. Its sides may be too close together, causing the inferior front teeth to project and to cross and strike on the outside of the upper incisors, or it may describe too large a circle.

These defects are regarded as hereditary, and are more peculiar to some nations than others. The tendency to them is observable in early childhood, and even in infancy. Many suppose they are determined by a rickety diathesis of the general system, but this opinion has been proven to be incorrect by the fact, that those affected with this disease generally have good palates and well developed jaws. So far, indeed, from its having any agency in their production, rickets is thought by some medical writers to be produced by dentition, assigning as a reason for this belief, its frequent occurrence at the period of life, when this process is going on; but this opinion is doubtless as incorrect as is the other and opposite one. The cause of rickets is involved in as much obscurity as is that of the peculiarities, now under consideration, in the formation of the jaws.

There is a species of deformity in the upper jaw, the cause of which is equally difficult of explanation, characterized by one or more divisions of the upper lip, alveolar ridge and palatine arch, and necessarily accompanied by an irregularity in the arrangement of the teeth. This deformity is always congenital, and oftentimes exceedingly difficult to remedy.

Any infringement of the laws of growth, or disturbance of the functional operations of any of the organs of the face or head, may, I have no doubt, determine an improper development of the jaws and a bad arrangement of the teeth; and on the other hand, a perfect, correct, and healthful performance of the several functions of all the parts concerned in the formation and growth of this portion of the organism, will secure a natural development and configuration of the maxillary bones.

OF THE MANAGEMENT OF SECOND DENTITION.

As it regards the beauty, health and durability of the teeth, there is nothing more to be dreaded, and at the same time more easily prevented, than irregularity in their arrangement. In proportion, too, to the deviation of these organs from their proper position in the alveolar arch, are the features of the face and the expression of the countenance injured. It also increases the susceptibility of the gums and alveolo-dental membranes to morbid impressions.

It is, therefore, important that the mouth, during the dentition of these teeth, should be properly cared for; and so thoroughly convinced am I of this, that I do not hesitate to say, that if timely precautions were used, there would not be one decayed tooth where now there are a dozen.

Much harm, it is true, may be done by improper meddling with the teeth during this period, but this, so far from inducing a total neglect, should only make those having the care of children, more careful to secure the services of scientific, accomplished practitioners.

For the judicious management of second dentition, much judgment and a correct knowledge of the periods of the appearance of the several classes of teeth, are required. All unnecessary

interference with these organs at this early period of life, should certainly be avoided, as it will only tend to mar the perfection at which nature ever aims. The legitimate duty of the physician being, as Mr. Bell correctly observes, "the regulation of the natural functions when deranged," he should never anticipate the removal, by nature, of the temporary teeth, unless their extraction be called for by some pressing emergency, such as a deviation of the permanent ones from their proper place, alveolar abscess, or exfoliation of the alveolar processes.

First dentition has received its due share of attention from medical men, but that of the adult teeth has been almost entirely overlooked by them, because, the management of it has never been considered as constituting any of the duties that belong to their department of medicine. Nor has it been accurately described by dentists generally, because, a knowledge of physiological science, which alone can qualify them for such a task, seldom constitutes any part of their professional acquirements.

Among the few who have treated this subject in a full and philosophical manner, I will mention Delabarre, whose work contains the most explicit directions in regard to it, of any that have as yet appeared. And owing to the superficial manner in which second dentition is so frequently studied, this author was led to remark, "That the laws which govern the expansion, growth, and arrangement of the teeth, are properly the patrimony of the physician, who should understand them, in order to direct the dentist whenever (which unfortunately is very frequently the case) he is not furnished with sufficient information on all the duties of his profession."

The mouth should be frequently examined from the time the shedding of the deciduous teeth commences, until the second set is completed; and when the growth of the permanent teeth so far outstrips the destruction of the roots of the temporary, that they are caused to take an improper direction, the primitive teeth, that have occasioned the obstruction, should be immediately removed. In the dentition of the upper front teeth, this should never be neglected; for, when they come out behind the temporaries, as in such cases they most frequently do, and are permitted to advance

so far as to fall on the inside of the lower incisors, a permanent obstacle is offered to their subsequent proper adjustment.

When a wrong direction has been thus given to the growth of the lower front teeth, they are rarely prevented from acquiring their proper arrangement by an obstruction such as that last noticed. They should not, however, on this account, be allowed to occupy a false position too long, for the evil will be found much easier of correction while recent, than after it has continued for a considerable length of time. The irregularity should, therefore, be immediately removed.

The permanent central incisors of the upper jaw, are much larger than those of the temporaries of the same class. It might therefore, be supposed, that the aperture formed by the removal of the one, would not be sufficient for the admission of the other, without an increase in the size of this part of the maxillary arch. It should, however, be recollected that, by the time these teeth usually emerge from the gums, the crowns of the temporary lateral incisors are so much loosened by the absorption of their roots, that they yield sufficiently to the pressure of the new teeth, to admit of their taking their proper position within the dental circle. When this, however, does not happen, the temporary laterals should be extracted.

Under similar circumstances, a similar course should be pursued with the permanent lateral incisors and the temporary cuspidati, and with the permanent cuspidati and the first bicuspidates.

The bicuspidates being situated between the fangs of the temporary molares, are seldom caused to take an improper direction in their growth. Neither are they often prevented from coming out in their proper places by want of room.

In the management of the dentition of the adult teeth, much will depend on the experience and judgment of the practitioner. If he be properly informed upon the subject, and gives to it the necessary care and attention, the mouth will, in most instances, be furnished with a healthy, well arranged, and beautiful set of teeth. At this time, "an opportunity," says Mr. Fox, "presents itself for effecting this desirable object," (the prevention of irregularity,) "but every thing depends upon a correct knowledge of the time

when a tooth requires to be extracted, and also of the particular tooth, for often more injury is occasioned by the removal of a tooth too early, than if it be left a little too long; because a new tooth, which has too much room long before it is required, will sometimes take a direction more difficult to alter, than a slight irregularity occasioned by an obstruction of short duration."

Mr. Bell objects to the extraction of the temporary teeth, especially in the lower jaw, to make room for the permanent ones, on the ground that the practice is harsh and unnatural—that it often gives rise to a contraction of the maxillary arch, and that in consequence of the peduncular connection that exists between the necks of the temporary teeth and the sacs that surround the crowns of the permanent ones, it interferes with the uniform deposition of the enamel.

These objections are certainly very forcible, and should deter every dentist from adopting the practice, except as a dernier resort—the least of two evils. But when the temporary teeth, by remaining too long are likely to effect the arrangement, and, consequently, the health of the permanent teeth, they should be extracted; because, in that case, their presence is an evil greater than any that would be occasioned by their removal. This last objection, however, can only apply to the extraction of the temporary teeth before the formation of the enamel. As a general rule they should be suffered to remain as long as they are not an injury to the permanent teeth and their contiguous parts.

When the permanent teeth are much crowded, the lateral pressure is frequently so great as to fracture the enamel. If this cannot be avoided, in any other way, one of the permanent teeth on each side should be extracted; for it is better to sacrifice two than permanently to endanger the health of the whole.

M. Delabarre, in cases where the crowding is not very great, recommends the passing of a file between the teeth; as also does Mr. Bell, when only the space that is usually occupied by half of a tooth, is required.

Notwithstanding the deservedly high authority of these two gentlemen, my own experience compels me to disprove the practice. The apertures thus formed by the file, soon close, but not

so perfectly as to prevent small particles of extraneous matter from getting in between the teeth, and being retained there until they become putrid,—vitiating the mucous and salivary secretions of the mouth, and thus occasioning decay. In this manner, I have sometimes known the front teeth to be entirely destroyed; and I have always observed, that those teeth which had been thus filed, were invariably the first, and sometimes the only ones, that became carious, thus clearly indicating the cause of their decay.

I do not, however, wish to be understood as conveying the idea that filing the teeth necessarily causes them to decay, for, when the file is used for any other purpose than to gain room, the apertures may be made large enough to prevent their approximation, and thus, all the injuries apprehended from the operation will be prevented.

The file should, therefore, never be used with a view to remedy an irregularity, the extraction of two teeth, one on each side of the jaw, however small the space required to be gained may be, is far preferable. The second bicuspid, *ceteris paribus*, should always be removed rather than the first, but sometimes, the extraction of the first becomes necessary. The extraction of these, however, should never be determined on, when the evil can be corrected by the removal of the others.

By the removal of two teeth, ample room will be gained for the development and regular arrangement of all the remaining organs, and the injuries that usually result from a crowded state of the teeth prevented.

On the filing of teeth, to prevent irregularity, Dr. Fitch judiciously remarks: "I consider the expediency of filing or not filing the teeth, ought to be a subject of serious deliberation on the part of the dental practitioner, and never, especially in young persons, perform the operation, unless obliged to do so, to cure actual disease.

"I was greatly surprised, in the late work of Mr. Bell, to see directions to file slightly irregular and crooked teeth, so as to gain about one half a tooth of room."

Nature, when permitted to proceed without interruption, is able to perform all her operations in a perfect and harmonious manner. But the functional operations of all the parts of the body

are liable to be disturbed from an almost innumerable number and variety of causes, and an impairment of one organ oftentimes gives rise to derangement of the whole organism; and for the relief of which, the interposition of art not unfrequently becomes necessary, and it is fortunate for the well being of man, that it can in so many instances be applied with success.

In sound and healthy constitutions, the services of the dentist are seldom required to assist or direct second dentition. And in remarking upon this subject Dr. Koecker observes, "that the children, for whom the assistance of the dentist is most frequently sought, are those who are either in a delicate, or at least an imperfect constitutional health; where the state, of not only the temporary teeth, but of the permanent also, is to be considered; and, where both are found diseased, the future health and regularity of the latter require the greatest consideration of the surgeon.

"Irregularity of the teeth is one of their chief predisposing causes of disease, and never fails, even in the most healthy constitutions, to destroy sooner or later, the strongest and best set of teeth, unless properly attended to. It is thus not only a most powerful cause of destruction to the health and beauty of the teeth, but also to the regularity and pleasing symmetry of the features of the face; always producing, though slowly and gradually, some irregularity, but not unfrequently the most surprising and disgusting appearance.

"It is, however, a great pleasure to know, that dental surgery is abundantly provided with the most sure remedies, and in the most delicate subjects, if placed under proper care, at an early age, the greater portion of the teeth of the permanent set may invariably be preserved in perfect health and regularity, in common with their relative and contiguous parts."

Finally, I would remark, that though nature is most generally able to complete the task assigned her, yet there are times when she requires aid, and it is then, and then only, that the services of the dentist are needed. Therefore, whilst, on the one hand, we should guard against any uncalled for interference, we should, on the other, always be ready to give such assistance, as the nature of any disturbance presented to our notice, may require.

CHAPTER TENTH.

IRREGULARITY OF THE TEETH.

THE temporary teeth seldom deviate from their proper place in the alveolar arch, but with the permanent teeth, irregularity of arrangement is of frequent occurrence. The incisors and cuspidati are more liable to take an improper direction in their growth than any of the other teeth. The first and second molares rarely deviate from the alveolar arch; for, like the teeth of first dentition, they encounter no obstructions in their growth and protrusion through the gums. Although of comparative seldom occurrence, it nevertheless does sometimes happen that the bicuspidates and dentes sapientiæ are affected with irregularity.

The first molares being the first of the second set that make their appearance, the ten anterior teeth are limited to the part of the arch occupied by the first set, and if this be too small to admit them, irregularity must of necessity ensue.

The dentes sapientiæ are sometimes prevented from coming out in the proper place in the lower jaw, by a want of room between the second molares and the coronoid processes; and in the upper jaw, by a want of space between the last named teeth and the angle of the jaw.

When a bicuspid is forced from its proper place, it turns inwards towards the tongue or outwards towards the cheek, according as it is in the upper or lower jaw. But it seldom happens that the bicuspidates acquire an improper arrangement, and when they do, the irregularity is rarely so considerable as that which is frequently met with in the incisors and cuspidati.

The last named teeth are oftentimes so much obstructed in their passage through the gums, that they are forced to deviate very considerably from their proper direction, and to come

out either before or behind the alveolar arch. When they come out anteriorly, and they do so more frequently than posteriorly, they often become a source of great annoyance to the upper lip, exoriating its mucous lining membrane, and sometimes causing ulceration.

The incisors of the upper jaw present a greater variety in the manner of their arrangement than any of the other teeth. The centrals sometimes come out before and sometimes behind the arch; at other times, their sides, next the medial line, are turned either directly or obliquely forwards towards the lip. The laterals sometimes appear half an inch behind the arch, looking towards the roof of the mouth; at other times, they come out in front of the arch; and at other times again, they come obliquely or transversely across it.

When any of the upper incisors are very much inclined towards the interior of the mouth, the lower teeth, at each occlusion of the jaws, shut before them, and thus become an obstacle to their adjustment. This is one of the most difficult kinds of irregularity to remedy, and one that often interferes with the lateral motions of the jaw.

The under front teeth sometimes shut in this manner even when there is no deviation of the upper to the interior. Here the irregularity is owing to a preternatural elongation of the lower jaw, which more frequently results from some fault in the dentition of the second denture, than from any congenital defect in the jaw itself.

Sometimes, the superior maxillary arch is so much contracted, and the front teeth in consequence so much projected, that the upper lip is prevented from covering them. Cases of this kind, however, are rarely met with, but when they do occur, they occasion much deformity of the face, and form a species of irregularity very difficult to remedy.

From the same cause, the lateral incisors are sometimes shut out from the row, and appear behind the centrals and cuspidati, the dental circle being filled up with the other teeth.

There are many other deviations in the arrangement of these teeth. Mr. Fox mentions one that was caused by the presence

of two supernumerary teeth of a conical form, that came up partly behind and partly between the central incisors, which, in consequence, were thrown forward, while the laterals were placed in a line with the supernumeraries; the central incisors, though half an inch apart, formed one row, and the laterals and supernumeraries, another. Mr. F. says he has seen three cases of this kind.

This description of irregularity, is rarely met with: I have, however, in the course of my observations, seen several cases of it.

M. Delabarre says, that cases of a transposition of the germs of the teeth, are occasionally met with, so that a lateral incisor takes the place of a central, and a central the place of the lateral. A similar transposition of a cuspidatus and a lateral incisor, also, sometimes occurs. Two cases of this sort have fallen under the observation of the author.

The incisors of the under jaw, being smaller than those of the upper, and in other respects less conspicuous, do not so plainly show an irregularity in their arrangement, nor are they so much affected by it. Still it should be guarded against, for any such disturbance, whether in the upper or lower jaw, is productive of injury to the health of the teeth, and to the beauty of the mouth.

The growth of the inferior permanent incisors is sometimes more rapid than the destruction of the roots of the corresponding temporaries. In such a case, the former emerge from the gums behind the latter, and sometimes so far back, that they very much annoy the tongue, and interfere with the enunciation. At other times, the permanent centrals cannot come into their proper place, because the space left for them by the molting of the temporaries, is insufficient for their reception. The irregularity in the former of these two cases, is greater than in the latter. The same causes, in like manner, affect the laterals.

M. Delabarre mentions a defect in the natural conformation of the jaws, by which the upper temporary incisors on one side of the medial line are thrown on the outside of the lower teeth, while the similar teeth, on the other side of the same line, fall within. The same disposition, he says, may be expected, unless

the defect be previously remedied, after the dentition of the permanent teeth.* I have never met with more than two cases of this sort, and I did not see the subjects of even these, until after they had become adults.

TREATMENT OF IRREGULARITY OF THE TEETH.

The efforts that are made to remedy or remove the irregularities of the teeth, should always be in strict accordance with the indications of nature, and whenever the permanent teeth are prevented from taking their proper place, she endeavors to correct the evil, and if foiled in her efforts, exerts herself for their expulsion. But at what period these efforts cease, may be difficult to determine. When the irregularity is neither great nor complicated, and its causes are removed before the nineteenth or twentieth year, the teeth of themselves soon find their proper position.

When, however, the exertions of the economy are unavailing, recourse should be had to the aid of the dentist, which, if properly rendered, can in almost every case, produce symmetry and regularity from deformity.

The practicability of altering the position of a tooth, after the completion of its growth, was well known to many of the earlier practitioners; but, as before the commencement of the present century, the more particular object of the dentist was, the insertion of artificial teeth, this branch of dentistry met with but little attention. Fauchard and Bourdet were among the first who turned their attention to it. They invented a variety of fixtures for adjusting such of the teeth as were not rightly arranged; but most of these were so awkward in their contrivance, and occasioned so much inconvenience to the patient, that they were seldom employed.

* Enfin il y a une espèce de torsion de l'une ou de l'autre mâchoire, et quelquefois de toute les deux, qui fait que les dents temporaires supérieures antérieures recouvrent les inférieures, d'après la meilleure disposition; tandis qu' à commencer de la ligne médiane, les semblables dents de l'autre côté, rentrent en dedans des inférieures; il est probable, dans ce cas, que si l' on n'y obvie, le même disposition se reproduira pour la seconde dentition.—*Traité De La Seconde Dentition*, p. 136.

Mr. Fox, whose name must ever hold a distinguished place in the catalogue of those who have contributed most largely to this department of surgical science, was the first to give explicit directions for remedying the irregularities of the teeth. These have formed the basis of the established practice for the last thirty or thirty-five years, and this long trial has proved that they were founded upon a knowledge of the laws of the economy, and much practical experience.

In describing the treatment for irregularity, I shall notice the means, by which some of its principal varieties may be removed; otherwise, the application of the principles of treatment would not be well understood, since it must be varied to suit each individual case.

Whenever an irregularity is discovered in the second denture, the sooner it is remedied the better, for, in general, the longer a tooth is allowed to occupy a wrong position, the more difficult will be its adjustment. The position of a tooth may sometimes be altered, after the sixteenth or eighteenth year, but generally, it is better not to delay the application of the means until so late a period. For a change of this kind may be much more easily effected before the several parts of the osseous system have acquired their full size, and while the process of new formation is in vigorous operation, than at a later period of life.

If, previously to this time, pressure be applied to a tooth, it causes a destruction of the side of the alveolus against which its fang is pressed. But this does not necessarily destroy the socket, for as the internal paries is destroyed, the external of the same side is thickened by a deposition of new bone; and the vacuum thus made on the opposite side, is filled up.

Though this pressure, at a later period of life, would occasion the destruction of the alveolus, there would be no corresponding osseous deposition; and thus, not only would the tooth be loosened, but a morbid diathesis would be induced in the periosteum of its fang, in the alveolar membrane, and in the gum, that would result in injury to the other teeth.

The age of the subject, therefore, should always govern the practitioner in forming a prognosis of the practicability of remov-

ing an irregularity. Previously to the sixteenth year, he may almost always form a favorable one, but after this time, his efforts will be less likely to succeed.

The first thing that should claim attention in the treatment of irregularity, is the removal of its causes. Whenever, therefore, the presence of any of the temporary teeth has given a false direction to one or more of the permanent, they should be removed, and the deviating teeth be pressed upon several times a day with the finger, in the direction they are to be moved. This, if the irregularity has been occasioned by the remaining of a deciduous tooth, will, generally, be all that is requisite.

But, when it is the result of a narrowness of the jaws, either natural or acquired, one of the secondary teeth on each side of the jaw should be removed, in order to make room for the admission of those that are improperly situated. The second bicuspidates are the teeth generally extracted, and their place is soon filled up by the falling back of the first, which usually makes ample room for the adjustment of the cuspidati and incisors. But if the first bicuspidates, do not of themselves, fall back into the places of the second, a ligature of silk should be tied round each and the first molaris, which should be renewed every two or three days, until the desired result is produced.

The most frequent kind of irregularity resulting from a narrowness of the jaws, is the projection of the cuspidati. These teeth, with the exception of the second and third molares, are the last of those of the second denture that are cut, and are consequently more liable to be thrown out of the arch than any of the others, especially when it is so much contracted as to be almost entirely filled before they make their appearance. The common practice, in cases of this sort, is to remove the cuspidati. But, as these teeth contribute more than any of the others, except the incisors, to the beauty of the mouth, and can, in almost every case, be brought to their proper places, the practice should certainly be discarded.

Therefore, instead of removing these teeth, room should be made for them by extracting two of the bicuspidates. Much judgment, however, is requisite to determine which of these teeth should be removed. If, between the first bicuspidates and the lateral inci-

sors, there be spaces of one-half the width of the cuspidati, the second bicuspid should be extracted instead of the first; but if there be not spaces of this width, the first should be removed; for although these might be carried far enough back, after the removal of the second, to admit the crowns of the cuspidati between them and the lateral incisors, still there would not be a perfect harmony of arrangement, for the fangs of the cuspidati would still cross those of the bicuspid; so that those of the latter would be deeply seated in the arch, while those of the former would be thrown forward so much, that they would occasion considerable prominences in the gums that cover their alveoli; which, in consequence, would be gradually destroyed, and thus the teeth would be loosened and ultimately caused to drop out.

But when there are spaces such as have just been described between the lateral incisors and first bicuspid, a disturbance of this kind will never occur, and when this is the case, the first bicuspid should not be removed, unless there be an irregularity in the arrangement of the incisors that cannot be adjusted in any other way.

The first bicuspid is next to the cuspidati in importance; hence, they should not be removed, unless it be absolutely necessary for the adjustment of the teeth occupying the anterior part of the arch.

The bicuspid is seldom affected with irregularity, but when one of them is not in its proper position, and there is a considerable crowding of the teeth that are anterior to it, it should be extracted; for, although the irregularity itself may not be very conspicuous, yet a degree of pressure would be kept up on the other teeth, which would of necessity be injurious to them.

The treatment of irregularity of the incisors of the upper jaw, is generally more difficult and complicated than that of the lower incisors. These teeth are more conspicuous, and, when well arranged, contribute more than any of the others to the beauty and pleasing expression of the mouth; their preservation and regularity are, consequently, of the greatest importance. Hence, the practice of removing the laterals, when they are situated behind the centrals and the cuspidati, and when the dental arch is not com-

pletely filled without them, is one that cannot be too strongly deprecated. Without these teeth, the beauty of the mouth, however well all the others may be arranged, is incomplete. They should never, therefore, be removed, unless their arrangement, and that of the other teeth, are such, as to render their adjustment otherwise impossible.

One of the most difficult kinds of irregularity to rectify, is, when the central incisors are so situated that their cutting edges, instead of being in a line with the arch, form an angle with it of from forty-five to ninety degrees. This peculiarity is rarely met with in both centrals, but often in one, while the other occupies its proper position.

Some practitioners have recommended, when the space between the central and lateral incisor is equal to the width of the crooked central, to correct this species of irregularity, either by twisting the central suddenly round with a pair of forceps, or by extracting and immediately replacing it in its socket, with its anterior face outwards.

This practice is objectionable, for the reason that if a tooth be extracted, or violently and suddenly turned in its socket, the vessels and nerves from which it derives its nourishment and vitality, are severed, and though its alveolar periosteal connection may be partially re-established, and an imperfect degree of vitality be thus kept up, still it will ever after be more or less obnoxious to the surrounding parts, and soon lose that peculiar animated appearance which characterizes healthy living teeth.

Moreover, the incisors, in consequence of the transverse being greater than the horizontal diameter of their fangs, can neither be suddenly twisted in their sockets, nor taken out and replaced with their labial surfaces outward, without injury to the alveoli.

Without incurring any of these evils, this species of irregularity may be corrected by accurately fitting a gold ring or band on the deviating tooth, with holes through it on the anterior and posterior edges of the tooth, through each of which a ligature should be passed and secured. The ligatures, thus fastened to the ring, should be carried back, one on one side, and the other on the other, in front and back of the arch, and secured to the bicus-

pides in such a way as to act constantly upon the irregular tooth. These should be renewed from day to day, until the tooth is turned in its socket, so that its labial face will present anteriorly.

If both central incisors are affected with this species of deviation, after one has been turned, a sufficient time should be permitted to elapse for the one first turned to become tight in its socket, before attempting to move the other.

But before any attempt is made to remedy an irregularity of this sort, it should be ascertained if there be room enough between the adjoining teeth, and if there is not, it should be procured by the extraction of the second bicuspid and moving the cuspid and lateral incisors back in the manner as before described.

For remedying a like irregularity of the lateral incisors, the same means will be found applicable.

Irregularity arising from the presence of supernumerary teeth, may generally be removed by their extraction; and if this is not effectual, then properly directed pressure should also be applied.

In all cases, in which the upper teeth in the front part of the mouth, are thrown forward and caused to project by the narrowness of the jaws, the second bicuspid should be removed, unless the first molars be decayed, in which case they should be extracted. The anterior teeth are thus allowed to fall back, and form a more regular curve. Mr. Fox recommends, in cases of this kind, that the first bicuspid should be extracted, but for reasons before stated, I think it better to remove the second.

There are other varieties of irregularities in the front teeth, but I shall only notice one, which, from its peculiar character, is sometimes exceedingly difficult to remedy. It is when one or more of the upper anterior teeth are placed so far back in the jaw, that the under ones come before them at each occlusion of the mouth; and thus present an insuperable obstacle to their ever being remedied without the aid of art.

Of this variety, Mr. Fox enumerates four kinds:—The first is, when one of the central incisors is situated so far back, that the lower teeth shut over it, while the other central remains in its own proper place, as represented in Fig. 34, copied from his work, as are also those which follow.

FIG. 34.

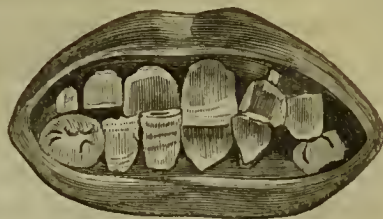


FIG. 35.

The second is, when both of the centrals have come out behind the circle of the other teeth, and the laterals occupy their own proper positions, as represented in Fig. 35.

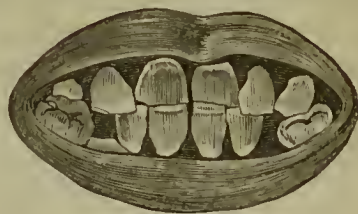


FIG. 36.

The third is, when the lateral incisors are thrown so far back, that the under teeth shut before them, while the centrals are well arranged, as exhibited in Fig. 36.

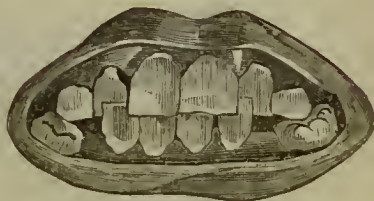


FIG. 37.

The fourth kind is, when all the incisors are placed so far behind the arch that the lower teeth shut before them, as in Fig. 37.



He might also have added to this variety of irregularity, a fifth description, for it sometimes happens that the cuspidati of the upper jaw are thrown so far back, that they fall on the inside of the lower teeth, and of this description, I have met with several cases.

Two things are necessary in the treatment of the kinds of irregularity which have just been described; the first is, to prevent the upper and lower teeth from coming entirely together, by

placing between them some hard substance, so that the former may not be hindered by the latter, from being brought forward. The second is, the application of some fixture, that will exert a constant and steady pressure upon the deviating teeth, until they pass those of the lower jaw, that obstruct them.

For the accomplishment of this, various plans have been proposed. Duval recommends the application of a grooved or guttered plate, and Catalan has invented an instrument, based, I believe, upon the same principle, but much better adapted to the purpose. The inclined plane of Catalan, although, until I had employed it, I doubted its utility, is certainly an effectual and speedy method of moving deviating front teeth in the upper jaw, from the interior of the arch to their places in it. It acts with great force, and in precisely the proper manner for the accomplishment of the object.

FIG. 38.

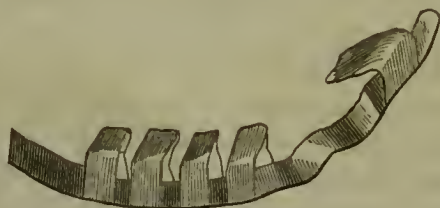
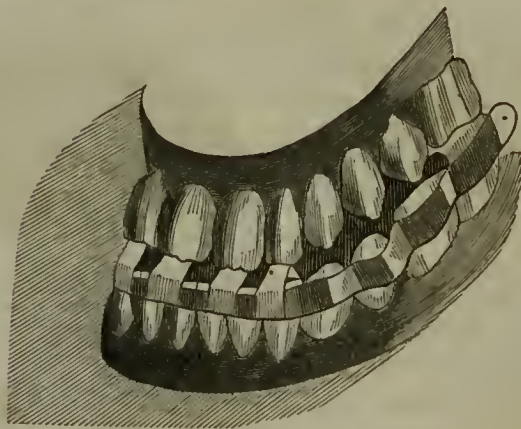


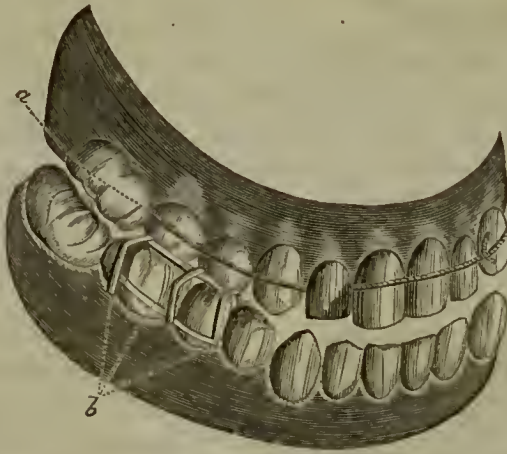
FIG. 39.



The accompanying cuts, copied from Catalan, exhibit the manner in which his inclined plane is constructed. The one

here represented, is applied to a case where all the upper incisors fall behind the lower. Its construction should be varied to suit the peculiarity of the case. If but one tooth deviates, but one inclined plane will be required. The apparatus should also be so adapted and secured to the teeth as to occasion as little inconvenience to the patient as possible. The circular bar or plate of gold, running round in front of the teeth, should reach from the first molaris on one side to the first molaris on the other, and the plate extending up from it to cover the grinding surfaces of these teeth, should be long enough to cover their inner or lingual sides also, as the whole fixture will thereby be rendered much firmer and more secure.

FIG. 40.



The plan proposed by Delabarre, is to pass silk ligatures round the teeth, in such a way that a properly directed and steady pressure will be exerted on such as stand on the inside or behind the arch, and, to keep the jaws from coming in contact, he recommends the application of a metallic grate, fitted to two of the inferior molares. (See Fig. 40,) taken from his treatise on second dentition.

This plan possesses the merit of simplicity, and occasions but little or no inconvenience to the patient; but, it sometimes will not only be found inefficient, but also to loosen the teeth adjacent

FIG. 40. *a* Ligature round the teeth; *b* Metallic grate on two of the lower teeth.

to those that are to be brought forward. The force on the irregular teeth, and those against which the ligatures act, being equal, and in opposite directions, the latter will be drawn back, while the former are brought forward; and thus the means that are used for the correction of one evil, will sometimes be productive of another.

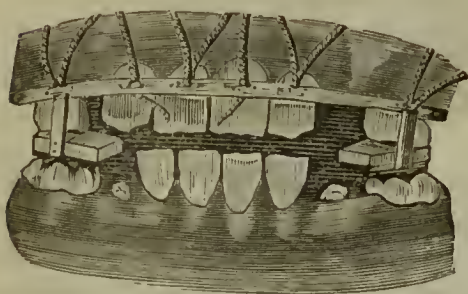
FIG. 41.



The means recommended by Mr. Fox, consists of a gold bar about the sixteenth part of an inch in width, and of proportionate thickness, which is bent to suit the curvature of the mouth, and fastened with liga-

tures to the temporary molares of each side. It is pierced, opposite to each irregular tooth, with two holes. The teeth of the upper and lower jaw, are prevented from coming entirely together, by means of thin blocks of ivory, attached to each end of the bar by small pieces of gold, and resting upon the grinding surfaces of the temporary molares. (See Fig. 41.)

FIG. 42.



After the instrument has been thus fastened to the teeth, silk ligatures are passed round such as have deviated to the interior, and through the holes opposite them, and then tied in a firm knot, on the outside of the bar. (See

Fig. 42.) The ligatures must be renewed every three or four days, until the teeth shall have come forward far enough to fall plumb on those that formerly shut before them, and acquired a sufficient degree of firmness to prevent them from returning to their former position. But as soon as the teeth shut perpendicularly upon each other, the blocks may be removed, and the bar alone retained.

For the last fifteen or twenty years, many practitioners, both in England and the United States, have substituted caps of gold for the blocks of ivory recommended by Mr. Fox; and, instead of simply bending the bar, they now stamp it between a metallic cast and die, so that all its parts, except those immediately opposite the irregular teeth, may be perfectly adapted to the dental circle. The apparatus, with these modifications, is more comfortable, and less liable to move upon the teeth.

Mr. Fox directs, that the blocks of ivory should be placed upon the temporary molares, but the caps of gold, that are now substituted, are entirely disconnected from the bar, and are often used after the molting of these teeth, they are therefore placed upon the first permanent molares.

As the caps prevent the teeth from coming together, mastication, during the time they are worn, must necessarily be performed on them. They should, therefore, be placed upon the largest and strongest teeth; and it is for this reason that the molares should be selected.

The curved bar should be washed and the teeth cleansed every time the ligatures are renewed. If this be neglected, the particles of food that collect between it and the teeth, will soon become putrid and offensive, and a source of disease both to the gums and teeth.

But before the bar is applied, it should be ascertained whether there be sufficient space for the reception of the deviating teeth, and if there be not, room should be made in the manner as before described.

Some diversity of opinion exists as to the most suitable age for the correction of this description of irregularity. Mr. Fox, it would seem, preferred the period immediately previous to the molting of the temporary molares,—probably the tenth or eleventh year after birth.

Some think, that the fore part of the dental arch continues to expand until the second denture is completed, and that the bicuspidates afford a better support for the ends of the bar than any other teeth, and are therefore content to wait until the fifteenth or even sixteenth year. But, though the arch does sometimes thus expand, yet even when the expansion occurs, it is generally

so inconsiderable, that very little advantage can be derived from it. Moreover, the arch, instead of expanding, is much more liable to contract whenever a vacancy occurs in the dental circle, either by the extraction, or from the improper growth of one or more of the teeth; hence the difficulty is very apt to be increased by delay.

The evil, it is true, may be remedied at the fifteenth, seventeenth, or even eighteenth year; but yet it is never advisable to defer it to so late a period.

The most that is required in the treatment of irregularity of the lower incisors, is to remove a tooth, and to apply frequent pressure to the teeth that are improperly situated. These teeth are less conspicuous than those of the upper jaw, and the loss of one of them, if the others are well arranged, is scarcely perceptible.

CHAPTER ELEVENTH.

PECULIARITIES IN THE FORMATION AND GROWTH OF THE TEETH.

IN the development and growth of the various parts of the human frame, many very curious and interesting anomalies are sometimes observed; but in no portion of it are they more frequent in their occurrence, or more diversified in their character, than in the teeth. These aberrations, however, are generally confined to the second denture; the first rarely exhibits any striking peculiarities.

The circumstances connected with the formation and growth of the permanent teeth, satisfactorily account for some of the aberrations that are here met with, but there are others, principally in shape and size, which cannot be so easily explained.

Mr. Fox gives a drawing of a tooth, that in its shape somewhat resembled the letter S. This deformity was occasioned by an obstructing temporary tooth.

The molares of the upper jaw, sometimes, have four or even five roots, and those of the lower jaw, three; and there are other peculiarities also in the crowns, especially in those of the class of teeth just mentioned, for which we cannot readily account.

These deviations of shape, to which the crowns of the teeth are subject, are usually confined to the molares, and consist principally of protuberances upon their sides, that very much resemble supernumerary teeth of a conical shape. What should determine the pulp to assume this shape, cannot well be explained.

The next peculiarity to be noticed, is that of size, and in this respect the teeth are very variable. Even in the same mouth,

the want of relative proportion between the different classes of teeth, is sometimes quite conspicuous. But instances of this kind are not very frequent, for where there is an increase or diminution in the size of the teeth of one class, there is generally a corresponding change in those of the other.

Aberrations of this character are probably dependent upon some diathesis of the general system, whereby the teeth, during the earlier stages of their formation, are supplied with an excessive or diminished quantity of nutriment.

Some very remarkable deviations have been known to take place in the growth of the teeth. The most singular case on record, is that narrated by Albinus: "Two teeth," says he, "between the nose and the orbits of the eye, one on the right side, and the other on the left, were enclosed in the roots of those processes that extend from the maxillary bones to the eminences of the nose. They were large, remarkably thick, and so very like the canini, that they might have seemed to be these teeth themselves which had not before appeared; but the canines themselves were also present, more than usually small and short, and placed in their proper sockets. The former, therefore, appear to have been the new canini, which had not penetrated their sockets, because they were situated where these same teeth are usually observed to be in children. But what is still more remarkable, their points were directed towards the eyes, as if they were the new eye teeth inverted. And they were also so formed, that they were, contrary to what usually happens, convex on the posterior, and concave on the anterior."* A case of a somewhat similar character is mentioned by Mr. John Hunter.

*"Dentes duo inter nasum et orbes oculorum, dexter sinisterque, inclusi in radicibus processum quibus ossa maxillaria ad eminentem nasum pertinent. Longi sunt, crassitudinis insignis. Similes maximi caninis, ut videri possint illi ipsi esse, non nati. At aderant præterea canini præter consuetudinem parvi, et breves, suis infixi alveolis. Itaque vidcantur esse canini novi, qui non cruprint uptote ibi loci collocati, ubi sunt novi illi in infantibus. Sed quod miremur sursum divecti, tanquam si sint canini novi inversi. Et ita quoque formati sunt ut, contra quamalii, a posteriore parte gibbi, ab anteriore sinuati sint," &c.—*Academ. Anastat. Liber 1, p. 54.*

The following case is in the words of Mr. G. Wait: "While I was prosecuting my anatomical studies, I was struck with the appearance of a cuspidatus of the upper jaw; it was short, and appeared as if the body of the tooth was in the jaw, and that it was the tip of the root that presented itself. Upon further examination, I found this verified; and after the cranium and lower jaw were properly macerated and cleansed, I found one of the lower bicuspidæ in the same manner."

I can readily imagine that a cuspidatus of the upper jaw might, while in a rudimentary state, be so altered in its position, as to pass up, in its growth, between the nose and the orbit. But that the crown, after having been thus turned round in the socket, should remain stationary, while the fang passed down and appeared outside of the gum, is a most extraordinary and remarkable anomalism. In the former instance the tooth might still continue to derive the nutriment necessary to its growth and vitality from the dental vessels; but in the latter case, it could not, because the apex of the root, the place where the vessels and nerves enter, are entirely without the gum.

The following is one of several cases of deviation in the growth of the teeth, that have come under my own observation. About nine years ago, I was requested to extract a tooth for a lady of this city, under the following circumstances. She had, for a time, experienced a great deal of pain in her upper jaw, and supposed it to originate from the second molaris of the right side, although this tooth was perfectly sound at the time. Meanwhile, her general health became impaired, and her attending physician, thinking that the local irritation might have contributed to her debility, advised her to have the tooth removed. On its extraction, the cause of the pain, at once, became apparent. The dens sapientiæ, which had not hitherto appeared, was discovered with its fangs extending back to the utmost verge of the angle of the jaw; while its grinding surface had been in contact with the posterior surface of the crown and neck of the tooth that had been just extracted. On the removal of the wisdom tooth, the pain in that jaw ceased.

Five years after the foregoing was written, I was informed by the brother of the lady, that the removal of the tooth in question,

was followed by a gradual restoration of her general health, and that it had since continued good.

I have two teeth in my possession, presented me by my brother Dr. John Harris, of Georgetown, Ky., of most singular shape. They were extracted by him in my presence, in July, 1822, from the right side of the upper jaw of a young gentleman, nineteen years of age, by the name of Crawford. They occupied the place of the first and second bicuspidæ, and their crowns are almost wholly imbedded in lamelated bone, that should have constituted their roots, but which are entirely wanting. Judging from their appearance, one would be inclined to suppose, that as they rose from their sockets, the latter filled up, and coming in contact with the former as they were forming, and while in a pulpy state, pressed against and caused them to bulge out and to be reflected up upon their crowns, to the enamel of which, nearly to their grinding surfaces, they are perfectly united.

For some time previously to their extraction, they had been productive of considerable irritation and pain in the gums and jaw, and it was for the relief of this that they were removed.

CHAPTER TWELFTH.

OSSEOUS UNION OF THE TEETH.

THOUGH I never doubted the possibility of an osseous union of the teeth, yet it was not until a few years ago, that I met with an instance of it.

During a visit to the city of Richmond, I was consulted in my professional capacity, by Mr. D. and Mr. A. On examining the mouth of the former, I discovered that the crowns of the central incisors of the upper jaw were perfectly united, their posterior surface presenting the appearance of one broad tooth; while their anterior or labial faces, had the same semblance as the like sort of teeth usually have. In the mouth of the latter, I found the anterior surfaces of the right central and lateral incisors of the lower jaw united in a similar manner; while the posterior phases of the same teeth were entirely disconnected. These being the first cases of the kind that I had ever seen, I obtained permission for Dr. F. B. Chewning, a respectable dentist of that city, to examine them.

Dr. J. D. McCabe, formerly of Fredericksburg, Va., but now of Richmond, a dentist of high standing, and of unquestionable veracity, informed me, in a conversation that I had with him some time since, that he had met with a case of osseous union between a second bicuspid and first molaris of the lower jaw, which was so palpable, that there could have been no doubt of its existence.

Mr. Fox has given the drawings of four cases, the originals of which, as Mr. Bell tells us, are still to be seen in the museum of Guy's Hospital. Mr. B. also informs us that he himself has seen four cases.

Dr. Koecker is sceptical with regard to the existance of osseous union, and attributes to those, who assert that they have met

with cases of it,—“a weak credulity,—a love of the marvellous,—or a desire to impose upon the world.” There is no one who entertains a higher opinion of Dr. K. as a practitioner, than myself, yet I think that he has not, in this instance, manifested a suitable degree of respect, not for hypothetical opinions, but for the credibility of a man (Mr. Fox,) whose veracity has never before been called in question, and who could not have been deceived in this matter.

Cases of this sort, it is true, are of very rare occurrence, and a connection of the fangs of two teeth, by an intervening portion of the alveoli, is very easily mistaken for an osseous union of the roots themselves. A few years since, in extracting a second molaris of the upper jaw, I brought the dens sapientiæ along with it. At first, I thought there was an osseous union of their roots, but upon close examination, I found a very thin portion of their alveolar paries between, to which their roots were firmly attached. Such a case as this, would, in many instances, be very apt to be set down as an example of osseous union.

It is easy to account for a *lusus naturæ* of this kind, by supposing a previous union of the pulps of the two teeth. But from the order in which the teeth are cut, some classes appearing long before others, it would, on this supposition seem, that it could only occur between the central incisors. It is not, however, thus limited. The central and lateral—the bicuspidæ—the two molares, are sometimes also thus united.

An osseous union of the teeth, is fortunately, of rare occurrence; for if it were otherwise, it would be productive of many accidents in the extraction of teeth. Apart from this latter consideration, it can be of but little importance, either to the practitioner, or to the physiologist.

Since the publication of the first edition of this part of the work, several cases of osseous union of the teeth have fallen under the observation of the author, and he now has several specimens in his anatomical collection. He has four of osseous union of the temporary teeth, one of which was presented to him by Mr. Townsend, and two of the others by Dr. Cassell, both dentists of this city.

CHAPTER THIRTEENTH.

SUPERNUMERARY TEETH.

THE production of supernumerary teeth is generally confined to the anterior part of the mouth, and much more frequently to the upper than to the lower jaw. They sometimes, however, appear as far back as the *dentes sapientiæ*, and Hudson says he has seen them even farther. I have now in my anatomical collection, two supernumerary teeth that were extracted, one from behind, and the other at the side, of one of the upper wisdom teeth, by Dr. F. B. Chewning, surgeon dentist, of Richmond, Va.

The crowns of supernumerary teeth that appear in the anterior part of the mouth, are generally of a conical form, situated between the central incisors, and have short, knotty roots. They sometimes bear so strong a resemblance to the other teeth, that it is difficult to distinguish them. I once saw two right lateral incisors in the lower jaw, both of which were so well arranged, and perfectly formed, that it was impossible to determine which of the two ought to be considered as the supernumerary. Mr. Bell mentions a case, in which there were five lower incisors, all of which were well formed and regularly arranged. I have also met with several cases in which supernumerary teeth in the lower jaw so closely resembled the natural incisors, that no difference could be discerned between them.

Supernumerary cuspidati never occur, but supernumerary bicuspidates are sometimes met with. Delabarre says, he has seen them; and I have twice met with these cases. In both of these instances the teeth were very small, not being more than one-fourth as large as the natural bicuspidates, with oval crowns, and placed partly on the outside of the circle, and partly between the bicuspidates. I extracted one of them, and have it

still in my possession. Its root is short, round, and nearly as thick at its extremity as it is at the neck of the tooth.

The supernumerary teeth, that appear further back than the *bieuspides*, though much smaller, bear a strong resemblance to the *dentes sapientiæ*.

This sort of teeth possess a peculiarity, for which it may seem somewhat difficult to account. Although they are generally imperfect in their formation, yet they are much less liable than natural teeth to decay. This, however, is to be attributed to the fact, that they possess a lower degree of vitality, are much harder, and consequently not susceptible to the action of the usual causes of decay.

The presence of these teeth, as has been before remarked, sometimes, though rarely, occasion great irregularity in the arrangement of the others. And even when they do not produce this effect, they should, as soon as their crowns have completely emerged, be removed; because of the disagreeable appearance they usually give the mouth. If their extraction is too long neglected, some difficulty will be experienced in bringing the other teeth sufficiently close together to fill up the gap that will be made between them.

CHAPTER FOURTEENTH.

THIRD SET OF TEETH.

THAT nature does sometimes make an effort to produce a third set of teeth, is a fact, which, however much it has hitherto been disputed, is now so well established, that no room is left for cavil or doubt.

The following interesting particulars are taken from *Good's Study of Medicine* :

"We sometimes, though rarely, meet with playful attempts on the part of nature, to re-produce teeth at a very late period of life, and after the permanent teeth have been lost by accident, or by natural decay.

"This most commonly takes place between the sixty-third and eighty-first year, or the interval, which fills up the two grand climacteric years of the Greek physiologists; at which period the constitution appears occasionally to make an effort to repair other defects than lost teeth. * * * * *

"For the most part, the teeth, in this case, shoot forth irregularly, few in number, and without proper fangs, where fangs are produced without a renewal of sockets. Hence, they are often loose, and frequently more injurious than useful, by interfering with the uniform line of indurated and callous gums, which, for many years perhaps, had been employed as a substitute for the teeth. A case of this kind is related by Dr. Besset, of Knayton, in which the patient, a female in her ninety-eighth year, cut twelve molar teeth, mostly in the lower jaw, four of which were thrown out soon afterwards, while the rest, at the time of examination, were found more or less loose.

"In one instance, though never more than one, Mr. Hunter witnessed the re-production of a complete set in both jaws, ap-

parently with a renewal of their sockets. 'From which circumstance,' says he, 'and another that sometimes happens to women at this age, it would appear that there is some effort in nature to renew the body at that time.'

"The author of this work once attended a lady in the country, who cut several straggling teeth at the age of seventy-four; and, at the same time, recovered such an acuteness of vision, as to throw away her spectacles, which she had made use of for more than twenty years, and to be able to read with ease the smallest print of the newspapers. In another case, that occurred to him, a lady of seventy-six, mother of the late Henry Hughes Eryn, printer of the journals of the House of Commons, cut two molares, and at the same time completely recovered her hearing, after having for some years been so deaf as to be obliged to feel the clapper of a small hand-bell, which was always kept by her, in order to determine whether it rung or not.

"The German Ephemerides contain numerous examples of the same kind; in some of which, teeth were produced at the advanced age of ninety, a hundred, and even a hundred and twenty years. One of the most singular instances on record, is that given by Dr. Slade, which occurred to his father; who, at the age of seventy-five, re-produced an incisor, lost twenty-five years before, so that, at eighty, he had, hereby, a perfect row of teeth in both jaws. At eighty-two, they all dropped out successively; two years afterwards, they were all successively renewed, so that, at eighty-five, he had at once an entire set. His hair, at the same time, changed from a white to a dark hue; and his constitution seemed, in some degree, more healthy and vigorous. He died suddenly, at the age of ninety or a hundred.

"Sometimes, these teeth are produced with wonderful rapidity; but, in such cases, with very great pain, from the callosity of the gums, through which they have to force themselves. The Edinburgh Medical Commentaries supply us with an instance of this kind. The individual was in his sixty-first year, and altogether toothless. At this time, his gums and jaw-bones became painful, and the pain was at length excruciating. But, within the space of twenty-one days from its commencement, both jaws were furnished with a new set of teeth, complete in number."

A physician of this city informed me, about twelve months since, that a case of third dentition had come under his own observation. The subject of it was a female, who, at the age of sixty, cut an entire set in each jaw, and distinctly recollected the periods at which the preceding sets were cut.

The following letter from Dr. McCabe presents another interesting case:

“DEAR HARRIS,—I have just seen a case of third dentition. The subject of this ‘playful freak of nature,’ as Dr. Good styles it, is a gentleman residing in the neighbourhood of Coleman’s mill, Caroline county, Virginia. He is now in his seventy-eighth year, and, as he playfully remarked, ‘is just cutting his teeth.’ There are eleven out, five in the upper, and six in the lower jaw. Those in the upper jaw, are two central incisors, one lateral, and two bicuspidates, on the right side. Those in the lower, are the four incisors, one cuspidatus, and one molaris. Their appearance is that of bone, extremely rough, without any coating of enamel, and of a dingy brown colour. Yours, &c.

JAMES D. McCABE.”

Two cases, somewhat like the foregoing, have come under my own observation. The subject of the first, was a shoemaker, Mr. M. of this city, who cut a lateral incisor and cuspidatus at the age of thirty. Two years before this time, he had been badly salivated, and, in consequence, lost four upper incisors, and one cuspidatus. The alveoli of these teeth were caused to exfoliate, and, at the time I first saw him, were entirely detached from the jaw-bone, and barely retained in the mouth by their adhesion to the gums. On removing them, I found two white bony protuberances, which, on examination, proved to be the crowns of an incisor and a cuspidatus. They were perfectly formed, and though they have never grown so long as the other teeth, yet, up to the present time, they have remained very firm in the jaw. The teeth, that he had lost by salivation, were preserved, and are now in my possession. They are large, and have all the characteristics of those of second dentition.

The subject of the other case, was a lady, residing near Fredericksburg, Virginia, who cut four right central incisors of the

upper jaw successively. One of her temporary teeth, in the first instance, had been permitted to remain too long in the mouth, and a permanent central incisor, in consequence, came out before the dental arch. To remedy this deformity, the deciduous incisor was, after some delay, removed; and, about two years after, the permanent tooth, not having fallen back into its proper place, was also extracted. Another two years having elapsed, another tooth came out in the same place, and in the same manner; and, for similar reasons, was also removed. To the astonishment of the lady and her friends, a fourth incisor, affected with the same irregularity, made its appearance two years and a half after the extraction of the first permanent tooth. When it had been out about eighteen months, I was called in by the lady, who wished me, if possible, to adjust it. Finding that it could not be brought within the dental circle, I advised her to have it extracted, and an artificial tooth inserted in its place.

I only saw one of the teeth that had been previously extracted; it was well developed, and I was informed that the others were equally perfect. All the circumstances, connected with these successive dentitions, were distinctly recollected both by the lady herself and by her friends.

It would seem, that the efforts made by nature for the production of a third complete set of teeth, are usually so great, that they exhaust the remaining energies of the system; for occurrences of this kind are generally soon followed by death.

PART SECOND.

PHYSICAL CHARACTERISTICS

OF THE

HUMAN TEETH AND GUMS, THE SALIVARY CALCULUS, THE
LIPS AND TONGUE, AND THE FLUIDS OF THE MOUTH,

TOGETHER WITH

THEIR RESPECTIVE LOCAL AND CONSTITUTIONAL
INDICATIONS.



PART SECOND.

CHAPTER FIRST.

GENERAL CONSIDERATIONS.

THE susceptibility of the body of man, to morbid impressions, differs in different individuals. In some, its functional operations are liable to be deranged from very trifling causes, while in others, they are much less easily disturbed. Nor do the same causes always produce the same effects. The susceptibility or tendency of the organism or part upon which they act, determines their character; and this is true, both with regard to constitutional and local diseases: with the physical structure generally, and all its parts separately considered, but with none more so than the teeth, gums, and alveolar processes. The teeth of some persons are so susceptible to the action of deleterious agents, that they no sooner emerge from the jaws, than they become involved in general and rapid decay; while those of others, though exposed to the same causes, remain unaffected through life. A similar difference of susceptibility also exists in the parts within which these organs are contained.

With the teeth, these differences of susceptibility, to be morbidly affected, are implanted in them at the time of their formation, and are the result of the different degrees of perfection with which this process is accomplished; for in proportion as these organs are perfect, is their capability of resisting morbid impressions increased, and as they are otherwise, is it diminished. This is true of every part of our being; but as the teeth are formed, if they be not impaired by disease, so they continue through life,

except that they gradually acquire a very slight increase of density, whereby their liability to disease, is correspondingly lessened.

Not so, however, with the other parts of our physical structure. They may be innately delicate, or imperfectly developed, and afterwards become firm and strong, or be at first healthy and well-formed, and subsequently become impaired, and, in proportion as they undergo these changes, their susceptibility or tendency to disease is increased or diminished. But the teeth are not governed by the same laws, neither physical nor vital, that regulate the operations of the other parts of the animal economy. Not only is the manner of their formation, but their diseases also, are different. The other tissues of the body, not excepting those which are identical in structure with these, are endowed with recuperative powers, whereby an injury sustained by them may be repaired by their own inherent energies, but the teeth do not possess such attributes.

Assuming these propositions then to be true, and that they are, especially those with regard to the teeth, I shall endeavour to make appear, it becomes an object of no trifling importance to discover the signs, by which the susceptibility or tendency of the human organism to disease, may be determined. But to do this, except in so far as the teeth, gums and alveolar processes are concerned, is not my present object, yet in the prosecution of the task which I have undertaken, I may take occasion to advert to certain constitutional, and other local tendencies that are indicated by the appearances and condition of the dental apparatus, the other parts of the mouth and its fluids.

M. Delabarre affirms, that by an inspection of the teeth, we can ascertain whether the innate constitution is good or bad, and my own observations go to confirm the truth of this opinion; but as this author adds a little further on, these are not the only organs that should be interrogated. The lips, the gums, the tongue and the fluids of the mouth should also be examined, to discover the health of the organism, and ascertain whether the original condition of the constitution has undergone any change.

Those who have not been in the constant habit of closely observing the appearances that are met with in the mouth, may be somewhat sceptical with regard to the information derivable from

them concerning the constitutional health, but those who have studied them with care, will not hesitate to say, that they are, in very many instances, by far more certain and accurate, than any which can be obtained from other signs. For example—the periods of the ossification of the different classes of both sets of teeth being known, we are enabled to discover whether the original or innate constitution was good or bad by the physical condition of these organs, for as the functions of the organism were at this time healthily or unhealthily performed, will they be perfect or imperfect; or in other words, will their texture be hard or soft.

In a treatise, entitled “*De dentitione*,” attributed to Hippocrates, but with how much truth I am unable to determine, it is said, three periods of ossification are ascribed to the teeth—the same, also, is acknowledged by M. Baumes. The first is while the fœtus is in the matrix, and has reference only to the temporary teeth, which are in part ossified at birth. The second generation or period of ossification, is confined to those which are formed during lactation, and consists, according (as M. Delabarre says,) to the “father of medicine,” of the incisors and cuspidati of replacement, and the first permanent molares. The third period embraces those which are formed from solid aliment, and consists of the second and third molares. The physical condition of the teeth will enable us to determine with an accuracy that can be relied on, the state of the constitutional health at the time they were respectively being formed.

Although, as has often been remarked by writers on odontology, the teeth of the child, like other parts of the body, are apt to resemble those of its parents, so that when those of the father or mother are bad or irregularly arranged, a similar imperfection will generally be found to exist in those of the offspring, it does not necessarily follow, and when it does, it is the result of the transmission of some constitutional impairment, whereby the formative process of these small bones is either disturbed or prevented from being effected in a perfect and healthy manner. The teeth of the child, therefore, as Delabarre correctly observes, may be said to depend upon the health of the mother, and the aliment from which it derives its subsistence. If the mother be

healthy, and the nourishment that is given the child be of a good quality, the teeth will be dense and compact in their texture, generally well formed and well arranged, and as a consequence less liable to be acted on by morbid impressions, than those of children deriving their being from unhealthy mothers, or that subsist upon aliment of a bad quality. Temperament, also, as I shall hereafter endeavour to make appear, exercises no mean influence upon the functional operations of the body. Upon it, the constitutional health depends to a greater extent than pathologists generally admit, and hence it is, that that of the child usually partakes of that of one or other, or both of its parents. "This," says M. Delabarre, "is particularly observable in subjects that have been suckled by a mother or nurse whose temperament was similar to theirs." To obviate the entailment of this evil, he recommends mothers, having teeth constitutionally bad, to abstain from suckling, and that this highly important office be entrusted to a nurse having good teeth,—asserting, at the same time, that by this means, the transmission of so troublesome a heritage as a bad denture, may be avoided.

Depending, then, as not only the physical condition of the teeth, but that also of the organization generally confessedly does, upon the quality of the nourishment from which subsistence is derived during infancy and childhood, it is highly essential that this be good, and that that, especially, derived from the breast, be from those only who are in the enjoyment of health, and possess good constitutions. Whenever, therefore, the employment of a wet nurse becomes necessary, the greatest care should be taken to secure one possessing these highly important and desirable prerequisites; and this cannot always be done without a knowledge of the signs that are indicative of the state of the constitutional health and temperament; and, as Delabarre judiciously remarks, there are cases where the physician cannot be too well assured whether the present good health be innate, or whether it is acquired,—stating, at the same time, as an example, that "when a strange nurse is about to be employed, he cannot be too scrupulous." He also tells us that the inspection of the breast only enables us to judge of the development of the gland, and the quality of the milk as it

then is, which may be good to-day, and in a short time become bad.

The truth of this observation has been verified in but too many instances, and it therefore becomes a matter of much importance to find some signs upon which a greater reliance can be placed, than those which are to be found in the appearance of the breast, the cheek, or the beating of the pulse. These are often deceptive.

The following are the signs enumerated by Professor Baumes, as essential for a nurse to possess. "An excellent nurse," says he, "should be of good morals; and, indeed, of fine physical qualities. Her age ought to be between twenty and thirty, and the colour of her skin natural. Her eyes should be lively and animated; her hair and her eyebrows brown or light coloured, her lips red, her teeth sound and good, her gums hard, and well coloured. She should have sweet breath; the nose unobstructed, and exhaling no odour—the neck sufficiently long, the chest large and well arched; her breasts ought to be loose, firm, and distended; elastic, and moderately large; with the nipples sufficiently irritable to be firm when the finger is passed under them, brown, long and thin; placed upon the middle of the declining part of the breast, in the middle of an elevated areola of an obscure red colour."* Besides these, he describes the qualities that the milk should possess, and the tests necessary to their ascertainment.

These qualities are all essential, and though they at first be possessed, they do not furnish positive assurance that there is no hereditary constitutional vice lurking in the system, that may not, by the debilitating process of lactation, become developed.

M. Delabarre, who seems to have devoted much time to the study of constitutional temperament, in remarking upon this subject says, "Having been often consulted in the choice of a nurse, I have always paid much attention to the constitutional condition of the mouth, and whenever a child, born of weak parents, or of those having delicate teeth, has been confided to a good nurse, she has procured for it good teeth, and a good temperament, unless some severe disease has rendered useless this precaution."

Alluding to the fallibility of the signs usually relied upon as

* Prof. Bond's Translation.

furnishing the requisite indications in this matter, the author, from whom I have just quoted, thus observes—"the semeiology of the mouth alone can make known to the physician whether that woman owes the beautiful carnation she possesses, to her parents, or has attained it from a skilful regimen. I have collected," says he, "some valuable facts on this subject, and I have met with some women, who, for a long time, have had a great interest in keeping out of view, that they had not always enjoyed as good health as they seemed to possess at the moment when they were soliciting employment. I would not have it thought that I suppose every woman having good teeth, is, indubitably a good nurse, for, even the most perfect constitution is susceptible of being deteriorated. We see, therefore, that to judge correctly of the past and present state of health, it is requisite to collect all the signs that can lead to this knowledge, and to obtain it, it is also requisite to be for a considerable time practised in these sorts of researches; for, as a beautiful carnation may mislead the judgment, so may handsome teeth be mistaken for good ones, which is not always the case. This remark is very important in practice, inasmuch as an infant suckled by a woman having bad teeth, very often has these organs similar to hers. These truths I could establish by a multitude of proofs, but they are so apparent, that it seems unnecessary to cite them."

Before I dismiss this part of my subject, I will quote from Professor Baumes, an anecdote, which he relates, conveying a no less severe than just reproof to mothers, who, regardless of the well-being of their offspring, commit those offices that nature designed them to perform, to mercenary nurses. "They who do so," he says, "merit the humiliation endured by the mother of the natural brother of Gracchus. This young Roman, when he returned from a military expedition, brought to his nurse more magnificent presents than he did to her who had given him birth. My mother! he says, you carried me nine months in your bosom, but as soon as you saw me you abandoned me. My nurse received me gladly; she carried me in her arms, and nourished me with her milk for three years;—all she did was voluntarily done. You carried me in your bosom and nourished me with your blood

from natural necessity. I feel more indebted to my nurse than to you, and I wished to show this by the difference of my presents.”*

There exists some diversity of opinion in regard to the influence that the quality of the nourishment from which subsistence is derived during infancy and childhood, exerts upon the future health and constitutional temperament. We are told by Delabarre, that a child, though it derives its being from weakly parents, may, by proper regimen, acquire a good constitution and temperament, and the truth of this observation has been fully verified. M. MAHON, a French dentist, and author of considerable acumen and celebrity, gives it as his opinion, that a person cannot be born with a good constitution, except those from whom he derives his being, be in good health, and of that age when life is vigorous. He at the same time admits, that a child coming from parents of the most perfect health, may have its constitution deteriorated by an impure lactation; and that a child coming from weakly parents, may acquire a good constitution, though it will always bear about it certain signs of that which it had inherited,—and thence, he deduces, that it is possible to discover, by an examination of the teeth, any tendencies that may be lurking in the system. He has certainly studied the subject very attentively, and his remarks are worthy of consideration. If all he says be not true, many of his observations, I think, are susceptible of proof.

In treating upon the physiognomical indications of the teeth, he says: “Does the child derive its life from parents that are unhealthy? The enamel of its milk teeth will be bad; the teeth themselves, will be surcharged with a bluish vapour, and in a short time, will be corrupted by a humid and putrifying caries. When the parents are only weakly or delicate, the enamel of the primary teeth will have a bluish appearance, there will be a tendency in them to a dry caries, which does not ordinarily make much progress, and seldom causes pain.”

Again he observes, “It was only by a determination to notice very accurately the differences which I remarked on the teeth of

* Prof. Bond's Translation.

numerous individuals, that I obtained these first truths. In the first instance, they were little more than mere conjectures, but by being daily increased, have now become diagnostics, about the certainty of which, I flatter myself, I cannot be deceived. It affords me pleasure to give an account in this place of a part of the means which I employed to arrive at the point which was the object of my researches. When I perceived some signs, as for example, shadowy lines on the primary teeth, and those of replacement of different children, I put all my application to work for the ascertainment of their cause, and when I believed I had found it, I interrogated their mothers, who generally confirmed the judgment I had formed. I then went on further; after calculations that seemed to me highly probable, I ventured to declare the period at which a great crisis or pain had happened, and in such a month of pregnancy; and I have had the satisfaction to find, that I had conjectured correctly. My expectations, based on the same procedure, have been crowned with success in *adults*, whose teeth, by the simple examination of them, have disclosed to me an advantage no less valuable than the first, namely, that of generally being able to tell, whether they were born of strong, weak, or aged parents; and also, if the mother has had several children, whether they were among the last," &c.

That a person experienced in these researches, may, by an examination of the deciduous teeth, tell, whether the mother, during the latter periods of pregnancy, had enjoyed good or bad health, there is no question. But it is very doubtful whether much can be ascertained, by an inspection of the milk teeth, concerning the health of the mother previously to the time of the commencement of their ossification, for upon the manner in which this is effected, depends their appearance and physical condition. The density of a tooth may be told at a single glance by a practised observer, and it is this and its colour, that are principally influenced by the condition of the system during their ossification. The shape of the teeth is determined by that of the jaws and pulps before the commencement of ossification. I am of opinion, therefore, that nothing positive, concerning the health of the mother during the first five or six months of pregnancy, can be learned from an inspection of the teeth of either dentition. From an inspection of

those of the second, no information whatever in relation to it can be derived, and if Mahon was fortunate enough in some instances to tell what it had been at an earlier period, his prognosis could not have been founded upon any thing more than mere conjecture.

The teeth while in a pulpy state, partake of the health of the organism generally. As that is healthy and strong, or unhealthy and weak, so will the elementary principles of which they are then composed, be deteriorated or of a good quality, but after ossification has commenced, the parts ossified cease to be influenced by or obey the laws of the other parts of the body. If the general health be good at the time this process is going on, it will be evidenced in their density and colour; if bad, in the looseness of their texture, &c.

This is a subject to which I have paid some attention. I have for a long time been in the habit of carefully noting the differences in the appearance of the teeth of different individuals and of both dentitions, and though I have been able to conjecture in some instances what had been the state of the mother's health during the first months of pregnancy, candour compels me to confess, that I have never been able to find any signs in the peculiarity of their shape, size, density, or arrangement, that indicated it. But from the moment that that part of the formative process of these organs commences, which is not influenced by subsequent changes in the general economy, certain peculiarities of appearance are impressed upon them that continue through life, and about the certainty of the indications of which, in regard to the general health, I think there can be no question.

In commenting upon the views which M. Mahon advances upon this subject, Delabarre says,* "if he had thrown the light of repeated dissections upon them, he would have acknowledged with Hunter, Blake, Mauro, Fox and Bunon, that the secondary teeth do not begin to ossify until about the sixteenth month after birth, so that the good or bad health of the parents at the time of conception, cannot in any way affect the teeth of replacement, which are not formed until after the child comes into the world."

But, however vague and erroneous may be some of the opinions of Mahon, he has certainly advanced many that are correct, and from which hints have been derived that have formed the foundation of some very valuable contributions to the science of the semeiology of the teeth.

LAVATER was laughed at and ridiculed for his enthusiastic belief in physiognomy, but the descriptions which he gives, with a view to the illustration of his favourite science, of the physical conformation of the various parts of the face, head, and other portions of the organism of man, embrace signs, which if applied to the study of semeiology, could hardly fail to lead to important results. Had the education and pursuits of this good and extraordinary man, fitted him for the investigation of this department of medical science, and had he entered into it with the same persevering ardour and zeal that he did that of physiognomy, he would have erected for himself an equally enduring monument of fame, and would thus perhaps have contributed as much to the amelioration of the condition of his fellows, as he has done by his physiognomical researches. In fact, of the importance of this subject, he seems to have been fully aware; and, after acknowledging his ignorance, he says, the physiognomical and pathognomical semeiotica of health and disease ought to be treated on by an experienced physician, stating at the same time, that from the few observations which he had made, it was not difficult to discover the diseases to which an individual in health is most liable. He regards physiognomical semeiotics, founded upon the nature and form of the body, as of great importance to the medical practitioner, that he might be enabled to say to an individual in health, you may expect this or that disease sometime in your life. Possessed of this knowledge, he would be able to prescribe the necessary preventives or precautions against such diseases as he was most liable to contract.

Among the signs which he notes as indicative of the temperament, he enumerates the shape, size, and arrangement of the teeth, but from the physical characteristics of these organs, when considered separately from other parts of the mouth, we only learn what the innate constitution was; they cannot be relied

upon as indices to the state of the health subsequently to the time of their ossification. Their own liability to disease, however, may be determined by their appearance, and with the signs, therefore, that are indicative of this, every dentist should be familiar, to enable him, when consulted with regard to the attention necessary to the preservation of these invaluable organs, to prescribe such precautionary measures as shall secure them against the attacks of disease.

With regard, also, to the information to be derived from an inspection of the teeth, concerning the innate constitution, it has been well remarked by Delabarre, that physicians may derive much advantage in pointing out the rules of domestic hygiene for the physical education of children; for, says this eminent dentist, "can he admit of but one mode? Has he not, then, the greatest interest, to be well assured of the innate constitution of each, for whom his advice is required, to enable him to recommend nutriment suited to the strength of its organs? Will he report only on a superficial examination of the face, its paleness, the colour of the skin, all of which are variable? Will he not regard the repletion, or leanness of the subject, the state of the pulse, &c.? Surely he will make good inductions from all these things; but, the minute examination of the mouth, will give him, beyond doubt, the means of confirming his judgment; for, besides, what we already know of the teeth, the mucous membrane of this cavity, receives its colour from the blood, and varies according to the state of that fluid." This latter is a fact, that the observation of the dental surgeon has an opportunity of confirming, almost every day; and which, when taken in connection with the physical characteristics of the teeth, together with those of the salivary and mucous secretions of the mouth, constitute data, from which, both the innate and present state of the constitutional health, may be determined with accuracy and certainty.

The symptoms of actual disease, have been minutely and repeatedly described, but the physiognomical signs by which the susceptibility of the human organization to morbid influences is determined, and the kind of malady most liable to result there-

from, do not appear to be so well understood. "Whatever," says the author last quoted from, "may be the knowledge which a practitioner may acquire of the changes that a disease, or even a tendency to a disease, may effect in the use of the functions of some organs, it is, at least, advantageous to be able to conjecture what has happened, in the whole of the system at another time. In fact, can a physician, when about to prescribe for a slight indisposition of a person whom he hardly knows, rely entirely upon the sabulous state of the tongue? Does not its aspect singularly vary? Is it not notorious, that in certain persons it is always red, white, yellow, or blackish? I, as well as others, have had occasion to make these observations on persons with whom it was always thus, but without their being subject to any of those indispositions that are so common in the course of life." These signs are as variable in sickness as they are in health, and consequently, can only be relied upon as confirmatory of the correctness of other indications that manifest themselves in other parts of the body.

The physical changes produced by, and characteristics of disease, have been described, both by ancient and modern medical writers, but the works that have appeared upon this subject, do not comprise all that is necessary to be known. For example,—if we examine the lips, tongue, and gums of a dozen or more individuals who are regarded as in health, differences in their appearance and condition will be found to exist. The lips of some will be red, soft, and thin; others red, thick, and of a firm texture;—some will be thin and pale; others red on the inside and pale on the edges;—some are constantly bathed with the fluids of the mouth, others are dry, and these differences of appearance and condition, are as marked on the tongue and gums as they are upon the lips, and are supposed to be attributable to the preponderance or want of existence in sufficient quantity of some one or more of the elementary principles of the organization. Hence, may be said to result the differences in temperament and susceptibility of the body to the action of morbid excitants.

We are informed by Lavater, and the same also, is asserted by others, that the body is composed after an established manner, "of various congruous and incongruous ingredients," and "that there is," to use the metaphor, "a particular recipe, or form of mixture, in the great dispensatory of God, for each individual, by which his quantity of life, his kind of sensation, his capacity and activity, are determined;" and that, consequently, each body has its individual temperament, or peculiar degree of irritability. That the humid and the dry, the hot and the cold, "are the four principal qualities of the corporeal ingredients, is as undeniable as that earth and water, fire and air, are themselves the four principal ingredients." "Hence," he argues, "that there will be four principal temperaments; the choleric, originating from the hot; the phlegmatic, from the moist; the sanguine, from air; and, the melancholic, from earth; that is to say, that these are predominant in, or incorporated with the blood, nerves, and juices, and indeed in the latter, in the most subtle, and almost spiritually active form. But it is equally indubitable to me, that these four temperaments are so intermingled that innumerable others must arise, and that it is frequently difficult to discover which preponderates; especially since, from the combination and interchangeable attraction of those ingredients, a new power may originate, or be put in motion, the character of which may be entirely distinct from that of the two or three intermingling ingredients." The truth of these propositions will hardly be questioned, and their admission at once affords a satisfactory explanation of the differences in the susceptibility of different organisms to the attacks of disease.

Assenting to these truths, and they are so self-evident that none can doubt them, I think it may be safely assumed, that as is the quality and respective proportions of the materials furnished for the growth, reparation and maintenance of the several organs of the body, so they will be. If, as I have before remarked, these be good, and in proper proportion, they will be endowed with health and vigour, and, as a consequence, capable of performing their respective functions in a healthy manner. But if their elementary ingredients, to use an expression of the author from whom I have just quoted, be bad, their functions will be more or less feebly performed.

These materials are furnished by the blood.* From this fluid, each organ receives such as are necessary to its own particular organization. The blood, therefore, exercises a most important influence upon the whole of the mechanism of the body,—determining, as it most undoubtedly does, the state of the health of all its parts, which, as Delabarre observes, is relative to its quality, and “that the general health results from that of all the system.” In order to this, harmony must exist between all the organs, but in consequence of the great variety and intermingling of temperaments, it rarely does, except, perhaps, in those people in whom the sanguine greatly predominates, and who have not become enervated by irregular and luxurious modes of living. And, even when it does exist, we are by no means certain that it will continue to do so; for exposed as the body is to a thousand causes of disease, its functional operations may, at almost any moment, become disturbed. Among the civilized nations of the earth, the peasantry of Great Britain, probably, possess as good constitutional temperaments as are any where to be found; and, yet, even with these people, we are told, that although the sanguinous greatly predominates, in a large majority of the subjects, it is combined and intermingled, in a greater or less degree, with others.

In all of these modifications the blood plays an important part: it determines the temperament of the individual, and as a consequence, the physical condition of all the tissues of the body that are subject to the general laws of the economy. But the dependency of the solids upon this fluid is only mutual; it also, is dependent upon them, and the condition of the one is relative to that of the other. The solids, if I may be permitted to use the metaphor, are the distillery of the fluids, while they in their turn nourish, repair, and maintain the solids. A change then in the

* Of the various writers who have treated upon this fluid, Magendie ranks deservedly high. To his persevering and laborious researches we are indebted for much valuable information. Not satisfied with mere conjecture, he instituted a great variety of experiments upon animals, which go to prove conclusively, that no one of its constituents can be dispensed with without manifest and serious injury to the whole organism,—and, that it is dependent for its living principles upon the motion that is given to it in the circulatory system.

condition of one, is followed by a corresponding change in the condition of the other. If the blood be of an impure quality, or any of the substances that enters into its composition exist in too great or too small quantity, it will fail to supply the solids with the materials necessary to the healthful performance of their functions, and, if not actual disease, a tendency to it, will be the result. And again, the purity of the blood is dependent upon the manner in which the solids perform their offices. While, therefore, duly appreciating the importance of this fluid, and its existence in a pure state, to the general health of the economy, I cannot ascribe to it, regardless of the functions of the solids, a controlling influence over the organism.

To distinguish all the nice and varied shadings of temperament, or states of the constitutional health, by the physiognomical appearances of the body, is perhaps impossible, or can only be done with great difficulty, and by those who have been long exercised in their observance; but to discover that which predominates is not so difficult a matter, and its indications are no where more palpably manifested than in the mouth. By an inspection of the several parts of this cavity, together with its fluids and the earthy matter found upon the teeth, I repeat, inductions may be made, not only with regard to the innate, but also, the present state of the constitutional health, serviceable, both to the dental and medical practitioner; and, in the further prosecution of this inquiry, I shall endeavour to point out some of the principal of the indications that are here met with,—the appearances by which they are distinguished, and to offer such other general reflections as the subject may, from time to time, seem to suggest.

CHAPTER SECOND.

OF THE PHYSICAL CHARACTERISTICS OF THE TEETH.

THERE are few dental practitioners of observation and experience, who have not noticed the marked differences that exist in the appearance of the teeth, gums, lips, tongue, and secretions of the mouth, of different individuals. They have also noted those of that earthy substance, (commonly called tartar) which is deposited in greater or less abundance, on the teeth of every person, and though all may not have sought their etiology, many have had occasion to notice, at least, their local indications, and to profit from the information which they have thus been enabled to derive. They have not failed to observe that the volume, colour, length, and arrangement of the teeth vary, and that these are indicative of the susceptibility of the organs to disease.

Teeth in which the earthy salts or phosphate of lime exists in great abundance, are generally of a dull, or heavy white, of a medium size, short, with thick cutting edges, those of each class of uniform dimensions, very hard, and after the middle period of life, gradually assume a faint yellowish appearance. This description of teeth is most frequently met with in persons of a sanguinous temperament, or at least, those in whom this greatly predominates; they rarely decay, and are indicative, if not of *perfect* health, of a state that bordered very closely on it at the time they were being ossified.

Such teeth are occasionally possessed by persons of all nations and classes, but far more generally, by labouring people in healthy northern latitudes. Among the inhabitants of England, Ireland, and Scotland, and more especially the middle and poorer classes, they are very common. They are also very frequently met with in the northern parts of the United States, the Canadas, the

mountainous districts of Mexico, and so far as I have had an opportunity of informing myself, in France, Russia, Prussia, and Switzerland. Those who have them, generally enjoy excellent health, and are seldom troubled with dyspepsia or any of its concomitants. It is this kind of teeth, which Lavater says, he has never met with, except in "good, acute, candid, honest men," and of whose possessors, it has been remarked, that, their stomachs are always willing to digest whatever their teeth are ready to masticate.

But, as it regards character or disposition of mind, it is, perhaps, more than questionable, whether any thing can be learned from the physiognomical appearances of the teeth, further than they may be influenced at the time of their ossification by the constitutional temperament or state of the general health, and though this may then be favourable to the production of such as possess the characteristics I have described, it may afterwards become so impaired as to retain but little of its original condition, while these organs, by reason of their exemption from the laws that govern the functional operations of other parts of the body, preserve theirs through life. Those who possess the temperament, however, necessary to the production of such teeth, usually have all their organs well developed, and as a very common consequence, have open, frank and cheerful dispositions. It is probable, therefore, that from having very frequently observed them in the possession of those who enjoy these happy qualities of mind, that this celebrated physiognomist was induced to regard them as an invariable accompaniment.

In confirmation of what I have before said with regard to the influence which the state of the general constitutional health at the time of the ossification of the teeth, exerts upon their susceptibility to morbid impressions, it is only necessary to mention the fact, well known and frequently alluded to, of the early decay of a single class, or a pair of a single class of teeth, in each jaw, while the rest, possessing the characteristics which I have just described, remain sound through life. Thus, whenever it happens, that a child, of an excellent constitution, is affected with any

severe disease, the teeth that are at the time undergoing the process of ossification, are found, on their eruption, to differ from those which received their earthy material at another time, when the operations of the organism were healthily performed. Instead of being of a dull or heavy white, and having a smooth uniform surface, they have a sort of chalky aspect, or are faintly tinged with blue, and have rougher and less uniform surfaces. Teeth of this description, are very susceptible to the action of corrosive agents, and as a consequence, rarely last long.

But, not willing to rest the correctness of these views upon mere hypothesis or vague conjecture, I have, in a great number of instances, where I have met with teeth thus varying in their physical condition and appearance, taken pains to inquire of those who had had an opportunity of knowing the state of the general health of the subjects at the different periods of the ossification of these organs, and in every case, where I have been able to procure the desired information, it has tended to the confirmation of the opinion which I have here advanced. Nor have I neglected to improve the many opportunities that have presented, in the course of a somewhat extended professional career, for making these observations.

Although the operations of the economy are so secretly carried on, that it is impossible to comprehend their mechanism fully, it is well ascertained, that the phenomena that result therefrom, are influenced and modified by the manner in which they are performed. If they be deranged, the blood, from which the calcareous materials that form the basis of all the osseous tissues are derived, is deteriorated, and furnishes these earthy salts in less abundance and of an inferior quality. Hence, teeth that ossify when the system is under the influence of disease, do not possess the characteristics necessary to enable them to resist the assaults of the corrosive agents, to which all teeth, are more or less exposed, and that rarely affect those that receive their ossific matter from pure blood.

The calcareous ingredients of these organs are furnished by the red part of this fluid, and the gelatine that is in them is derived from the white or serous part;—"whence," as Delabarre re-

marks, "it results that the solidity of these bones vary according as the one or the other of these principles predominates," and the relative proportions of these, as I have endeavoured to show, are regulated by the state of the blood at the time the teeth are undergoing ossification. In healthy subjects, the blood is composed of about four parts of crassamentum, or clot, which is the red part, and one of serum, but the relative proportions of these are not always the same. Disease tends to diminish the red, and to increase the white or serous part of it. Sometimes the serum forms more than one-half of this fluid, and as this abounds at the time of the solidification of the teeth, they will be soft in their texture, and liable to decay.

The researches of Duhamel go to prove, that bones acquire solidity no faster than the parts which are about to ossify become charged with red blood. The experiments of Haller, are also confirmatory of this opinion. And, Delabarre, in remarking upon the ossification of the teeth, says, "the superficial layer of the pulp reddens before it ossifies, whilst all below is entirely white; soon another layer reddens, is ossified and then whitens, and so on, successively."

There is one circumstance, however, that appears to have escaped the notice of osteologists, that might seem to militate against the doctrine that the calcarious ingredients of bony structures are exclusively derived from the red part of the blood; and that is, the increase of density which the teeth continue through life very gradually to acquire, notwithstanding the prevailing opinion, that the fluid they circulate subsequent to their ossification, is not so much as even tinged with red. But, that these organs are capable of being injected with red blood, has been satisfactorily shown; and, if teeth are capable, under any circumstances, of being injected with red blood, is it unfair to presume, that a portion of the crassamentum or red part of this fluid may become so diluted with the thinner or watery parts of it, as to be forced with them into the vessels of these organs by the impetus which is ordinarily given to it by the circulatory apparatus? I am of the opinion that it is not, and that it is in this way that the increase of density which these organs acquire is to be accounted for. A sufficient quantity of earthy salts, I should suppose, might

be conveyed to them through the vessels with which they are penetrated, to effect the very trifling and almost imperceptible increase of density they acquire, subsequently to their ossification. The hypothesis, I am aware, does not accord with the views of Hunter in regard to the organization of the teeth, nor with those of several modern European writers on odontology, who maintain that these organs are not endowed with vascularity, but the incorrectness of this doctrine has been shown beyond the power of successful refutation. The circumstance to which I have just alluded, of the injection of the teeth with red blood, at once settles this question, and renders its further discussion on the present occasion unnecessary.

Having digressed thus far, I shall now proceed to notice a description of teeth quite different from those which I first described. The following are their characteristics :—They have a bleached, or azure blue appearance, they are most commonly long, the incisors thin and narrow, the cuspidati usually round and pointed, the bicuspidates and molares small in circumference and deeply indented upon their grinding surfaces.

Teeth possessed of these characteristics are generally very sensitive, easy to be acted upon by corrosive agents, and to the ravages of which, unless great attention be paid to their cleanliness, they usually fall early victims. They are also frequently affected with atrophy, or have upon their surfaces, white, brown or opaque spots,—varying in size and number. Several are sometimes found upon a single tooth, and in some instances every tooth in the mouth is more or less marked with them.

But this is not the only description of teeth liable to be affected with this disease. These spots are occasionally met with on teeth of every degree of density, shape, shade, and size; but they are, probably, more frequently seen on such as last described, than any other, and besides, it often happens that they are affected with erosion on emerging from the gums, and sometimes so badly as to place both their restoration and preservation beyond the reach of art. This species of erosion, or that which takes place while the teeth are in their matrices, is caused

by some morbid condition of the fluid within which they are there bathed, and is denominated congenital.

Teeth like those under consideration, are indicative of a weakly, innate constitution,—of a temperament considerably removed from the sanguinous,—and of blood altogether too serous to furnish materials, such as are necessary for the building up of a strong and healthy organism. They are more common to females than males, though many of the latter have them. They are met with among people of all countries, but by far more frequently among those who reside in sickly, southern latitudes, and whose systems have become enervated by luxurious modes of living. Among the inhabitants of Great Britain, they are more rare than they are among those of the United States, and those who have them, seldom attain to a great age. Nevertheless, some, under the influence of a judicious regimen, and a salubrious climate, though innately delicate, as has been the case with most of those who have this kind of teeth, do acquire a good constitution, and live to a great age, while the dental apparatus, less fortunate, except the most rigid and constant attention have been paid to the use of the means necessary for its preservation, generally soon falls an early victim to the ravages of disease.

There is another description of teeth, though differing in many of their characteristics from those, of which I have just been speaking, that are, nevertheless, not unlike them in their texture and in their susceptibility to deleterious impressions. The crowns of these are much larger than teeth of the ordinary size; their faces are rough and irregular, with protuberances, rising, not only from the grinding faces of the bicusps and molares; but also, not unfrequently, from their sides, with correspondingly deep indentations. Their appearance is that of a muddy white. The crowns of the incisors of both jaws are broad, long and thick. The posterior or palatine surfaces of those of the superior maxillary are rough, and usually have a deep indentation in them. In the majority of cases, their arrangement is tolerably regular, though they are more or less inclined to project. Their alveolar ridges usually describe a broad circle, and evidence a development, which, though large, is, in many re-

spects faulty. The excess in size, both here and in the teeth, seems to consist more of gelatine than calcareous phosphate.

This description of teeth decay readily, and in some instances appear to set at defiance the resources of the dentist. They are liable to be attacked at almost every point, but more particularly in their indentations and on their sides which come in contact with each other.

I am acquainted with a family, consisting of seven or eight members, most of whom are adults, and all have this sort of teeth. The most thorough and constant attention has been paid by each, to the use of the most approved remedial means, and yet all have lost a greater or less number of their teeth. They are generally first attacked on their lateral surfaces and in their indentations, but neither their labial faces nor most prominent points, are exempt from caries. No sooner than its progress is arrested in one place or part, than it appears in another. I have had occasion to fill a single tooth in as many as four, five, or six different places, and in this way, though my efforts at the preservation of a considerable number of them have proved abortive, I have been able to save some for a few years. But it is not necessary to particularize cases. Every practitioner has seen teeth like these, and is aware of the difficulty of their preservation.

It may be remarked, however, that the corrosive properties of the fluids of the mouth are sometimes so lessened by an amelioration of the constitution, that notwithstanding the great susceptibility of the teeth, of being acted upon by them, they may not for years, or until the general health relapses into its former, or some other unfavourable state, exert any very active or decidedly bad effects upon them. This has happened in several instances that have come under the author's own immediate observation, and it should be borne in mind, that the solvent qualities of these juices, are influenced by the state of the constitutional health. So far as that can effect these fluids, and no farther, it may exert a beneficial or prejudicial action upon the teeth.

Persons who have teeth like those now under consideration, generally have what Laforgue calls, lymphatico-serous temperaments. Their blood is usually pale, and the fluids of the mouth,

while they are poured out in great abundance, are for the most part exceedingly viscid. They do not have that white frothy appearance that is observable in those of healthy sanguinous individuals.

Laforge enumerates among the Europeans, three classes, each differing from the others in the quality of the materials that compose their respective organisms, that can be distinguished by their teeth. The first of these classes have pure blood, a good constitution, and as a consequence, their osseous tissues are compact, their flesh firm, and all of their fluids of a healthy and good quality. The second class have sanguino-serous temperaments, and the third lymphatico-serous.

The first of these classes, he tells us, have handsome teeth, well enamelled and of a cream colour. The molares of the first dentition, of the second class, and sometimes the secondary incisors and cuspidati, are eroded, and the third class, he says, have teeth that are very white, brittle, and that are easily affected with caries.

The kind of teeth which he assigns to the third class, though frequently possessed by those who belong to it, are oftener met with among those of the second. It is among those of this class that the teeth which I last described are most frequently found.

Continuing the subject, he says, "there are in each constitution two degrees that are distinguished by the quality of the materials that compose the teeth. The second degree of the first class, has not so much of the bony structure, and their enamels are thinner than in the first degree; neither is the flesh, the blood, or any of the fluids of so good a quality. Persons of the second class are not so healthy as those of the first. There is nothing to distinguish them, except that the one constitution is more perfect than the other.

"In the second constitution erosion is more strongly marked in the first than in the second degree, and it has its seat upon the incisors instead of the large molares of the first dentition. In the third constitution, the second degree is marked by the softness of the teeth, which are more subject to caries than the first degree. The quality of the blood, the flesh, fluids, and the

health and strength of subjects of the second and third constitutions are always in proportion to the density of the osseous system."

The present state of the constitutional health is not, as Laforgue supposes, indicated by the appearances of the teeth. The health of the general system is liable to impairment from a thousand causes, and though it be such, as may be necessary to "*handsome, well enamelled, and cream coloured teeth*," at the time of their formation, it may afterwards become bad, while these organs will retain their primitive characteristics. If the character of the original constitution is maintained, its condition may be ascertained by the appearance of the teeth. It is probable, therefore, that Laforgue had reference to those cases only where it had not undergone any change, and if so, his views are unquestionably correct.

The classes of constitutions which he particularizes as distinguishable among the Europeans, by the appearances of the teeth, are all met with in the United States, together with an almost countless number of intermediary ones. They cannot, however, be so readily determined from an examination of the dental organism, for the reason, that both present a much greater variety, and that though the first be primitively good, it is more subject here than there to impairment—a change, as has been before intimated, in which the latter does not participate. The reason of this, I am inclined to believe, is owing more to the difference in the habits and modes of living of the inhabitants of the two countries, than that of any difference in the salubrity of the climates.

As teeth that are neither too large nor too small, and that have a close compact structure, and slightly tinged with yellow, are indicative of a constitution, whatever it may be at the present time, that was innately good, so those that are long, narrow, and faintly tinged with blue, as well as those that greatly exceed the ordinary size of these organs, and that are irregular in shape, and that have a rough and muddy appearance, furnish assurance of a constitution, that was, at least, originally bad. The first of the

latter descriptions of teeth are more frequently met with among females than males, and among those of strumous temperaments, than those in whom this diathesis does not exist. There is another kind of teeth that resemble these in shape and size, and also, in texture, that have been more universally regarded as denoting a tendency to phthisis pulmonalis, than any other description that have attracted the attention of writers on this disease. They are characterized by whiteness, and a pearly gloss of the enamel, and are thought by many to be exceedingly durable, but I have observed that individuals who have this sort of teeth, when attacked by febrile or any other form of disease that had a tendency to alter the fluids of the body, were very subject to tooth-ache and dental caries, and that when this condition of the general system was continued for a considerable length of time, that their teeth, in rapid succession, crumbled to pieces.

It would seem, from this circumstance, that the fluids of the mouth, in subjects of strumous temperaments, if free from other morbid tendencies, are less prejudicial to the teeth than those of persons of most other constitutions, and I am of the opinion that it is owing to this that they are so seldom attacked with caries. M. Delabarre is of the opinion that caries supervenes to this disease, and is a consequence of the general debility that is engendered by it. He says, however, that "the patient generally dies before the central ganglion arrives at that state in which its properties are changed."

Now, this is directly opposed to all observations on the subject, for it is well known, that teeth are less affected by this disease than almost any other, and it is unfortunate for the doctrine, which he in another place espouses, that the bony tissue of these organs are softened by the ceasing of the arteries to supply it with calcareous materials, that he should have resorted to this argument. Its absurdity is rendered apparent by his own showing, and that too, in the paragraph succeeding to the one in which it is used. He says, "whatever may be the diseased condition of the teeth, they may be examined as unexceptionable evidence, that will inform us whether the patient owes his present state of health to a predisposition, or whether having supervened during the course of his life, it depends on an accidental cause."

If the state of the health, subsequent to the ossification of the teeth, were capable of diminishing or increasing the density of these organs, we could learn nothing from an inspection of them concerning the primordial constitution. Nor would we, therefore, be able to determine whether the present state of health was the result of constitutional predisposition, or that of some other cause; for, if they were subject to changes, like other parts of the body, their physical condition might be different to-day from what it was yesterday, so that a diagnosis, founded upon the appearance of the teeth, would be nothing more than mere vague conjecture.

But, although Delabarre is, in many things, somewhat inconsistent, very many of his views are correct, and few men have contributed more largely by observation and experience, to the advancement of the science of the teeth, than he has done.

In speaking of persons who have that kind of teeth, which, though beautiful, from having smooth and apparently polished surfaces, present shades intermixed with a dirty white, he says, they "have had alternations of good and indifferent health during the formation of the enamel. These teeth," he continues, "ordinarily have elongated crowns, and may present marks of congenital atrophy." Again he observes, "teeth of this sort deceive us by appearing more solid than they are; they remain sound until about the age of fourteen or eighteen; then, at this period, a certain number of them decay, especially when in infancy, the subject was lymphatic, and continues to be so in adolescence. This description of teeth is frequently met with among the rich classes, where children born feeble, reach puberty only by means of great care, and, consequently, owe their existence only to the unremitting attention of their parents, and the strengthening regimen that the physician has caused them constantly to pursue. Having reached the eighteenth or twentieth year, their health is confirmed, but the mucous membranes ever after have a tendency to be affected; the redder colour of the mouth, more especially its interior, and that of the lips, and the upper part of the palate; which, by degrees, discovers itself as the subject gradually advances in existence, shows its ameliorated condition. It is thus, that numerous persons, having gained a sanguinous temperament, would deceive us, if it were not that some marks of erosion are

seen on the masticating surfaces of the first permanent molares, which informs us that the present health is the result of amelioration."

There are other cases where the teeth are of so inferior a quality, that they no sooner emerge from the gums than they are seized upon and destroyed by caries, while the subjects who possess them, as has been intimated in another place, are enabled, by skilful treatment, to overcome the morbid constitutional tendencies, against which, during the earlier years of their existence, they had to contend, and eventually, to acquire excellent health. But in forming a prognosis, it is essential to ascertain whether the general organical derangement that prevented the teeth from being well formed, and thus gave rise to their premature decay, is hereditary, or whether it has been produced by some accidental cause subsequent to birth. The procurement of health in the former case, will be less certain than in the latter, for, when the original elements of the organization are bad, the attainment of a good constitution is by far more difficult.

Persons of sanguino-mucous temperaments, who have suffered in early childhood, from general febrile or inflammatory diseases, often have their teeth affected with what Duval calls the deeor-ticating process, or the denudation of their enamel, resulting, no doubt, from the destruction of the intermediary substance, which constitutes the bond of union between it and the bone.

The teeth of persons who have suffered from small-pox, measles, or other severe forms of eruptive disease or malignant inflammatory fever, during the time of their enamelling, often present a very singular appearance, unlike those that are affected with the ordinary kind of erosion, where the edges of the enamel around the part affected are rough and brittle, they are smooth, or comparatively so, while the injury is confined to only very small and regularly circumscribed spots, which extend in a direct horizontal line across such of the teeth as have been attacked by it. These pits are sometimes so close to each other that half a dozen or more of them are united so as to form a sort of narrow and irregular groove. Two, and sometimes more, of these grooves or rows of

pits extend across the same teeth, but this happens only in those cases, in which the subjects have either had relapses, or been affected, during the enamelling process, with more than one of the diseases that give rise to their formation.

There are many other characteristics which the teeth present in shape, size, density and colour, and from which, valuable inductions might be made, both with regard to the innate constitution and the means necessary to their own preservation; but as the limits I have prescribed to this part of my subject will not admit of their consideration, I shall conclude by observing, that the appearances of these organs vary almost to infinity. Each is indicative of the state of the general health at the time of their formation,—and of their own physical condition and susceptibility to injury.

CHAPTER THIRD.

OF THE PHYSICAL CHARACTERISTICS OF THE GUMS.

LITTLE can be ascertained concerning the primordial constitution from an inspection of the gums. Subject to the laws of the general economy, their appearance varies with the state of the constitutional health and the condition and arrangement of the teeth. Although the immediate or proximate cause of disease in them may be regarded as local irritation,—produced by depositions of tartar upon the teeth, or decayed, dead, loose, or irregularly arranged teeth, or a vitiated state of the fluids of the mouth, resulting from general organical derangement, or any or all of the first mentioned causes, their susceptibility to deleterious impressions, is influenced to a very considerable extent by the constitution; and, the state of this, determines too, the character of the effects that are produced upon them by local irritants. For example, the deposition of a small quantity of tartar upon the teeth, or a dead or loose tooth, would not, in a healthy person, of a good constitution, give rise to any thing more than a slight redness or tumefaction of the margin of the gums in immediate contact with it; while in a scorbutic subject, it would cause it to assume a dark purple appearance for a considerable distance around, to become flabby, more turgid, and to separate and retire from the necks of the teeth, or to grow down upon their crowns, to ulcerate and bleed from the slightest injury, and to exhale a foetid odour. And, in proportion as this disposition of body exists, their liability to be thus affected is increased; and, it is only among constitutions of this kind, that that peculiar preternatural prurient growth in them, by which the whole of the crowns of the teeth sometimes become almost entirely imbedded in their substance, takes place.

But notwithstanding the dependency of the condition of the gums upon the state of the constitution, they are occasionally affected with sponginess and inflammation in subjects of the best temperaments and of uninterrupted good health. The wrong position of a tooth, by causing a continued tension of that part of the gum which invests its alveolus, sooner or later, gives rise to a sort of chronic inflammation in it, and the alveolo-dental periosteum, and a gradual wasting of its substance, about the misplaced organ. Tooth-ache, too, from whatever cause it originates, often produces the same effects, and the formation of salivary calculus upon the teeth, however small the quantity, is likewise prejudicial to their health.

All of these may occur independently of the state of the general health. A bad arrangement of the best constituted teeth, and tooth-ache, may be produced by a multitude of accidental causes, independently of the functional operations of the other parts of the body.

Therefore, while the appearance and physical condition of this peculiar and highly vascular structure, are influenced, in no inconsiderable degree, by the habit of body, they are not diagnostics that always and with unerring certainty indicate the pathognomic state of the general system. It can, however, in by far the larger number of cases, where the gums are in an unhealthy condition, be readily ascertained, whether the disease is altogether the result of local irritation, or whether it has been favoured by a constitutional tendency. A comparison of the different effects, that are produced upon them by the same causes, in different individuals, will enable a careful observer, in most instances, to decide without much difficulty.

In childhood, or during adolescence, when the formative powers of the body are all in active exercise, and the nervous susceptibilities of every part of the human frame highly acute, the sympathies between the gums and other parts of the organism, and particularly the stomach, are, perhaps, greater than at any other period of life. The general health, too, at this time, is more fluctuating, and with all the changes this undergoes, the gums vary. Moreover, there are operations which are carried on

beneath and within their substance, which are almost constantly altering their appearance and physical characteristics,—and which, being additionally influenced by various states of health and dispositions of body, it may readily be conceived, that those which are met with in one case, might be looked for in vain in another.

Having arrived at that age when all the organs of the body are in the full vigour of maturity, and not under the debilitating influences to which they are subject during the earlier periods of life, the gums participate in the happy change, and as a consequence, present less variety in their characteristics. The general irritability of the system is not now so great, the gums are less susceptible to the action of irritating agents, and as a consequence, less frequently affected with disease; but as age advances, and the vital energies begin to diminish, the latent tendencies of the body are re-awakened, and they are again easily excited to morbid action.

In subjects of the most perfect constitutions, and during adolescence, they present the following appearances. They have a violet colour, a firm consistence, rough surface, their margins form along the outer surfaces of the dental circle, beautiful and regular festoons, and their mucous membrane, as well as that which covers all the other parts of the mouth, has a fresh, lively, roseate appearance.

The time for the molting of a primary tooth is announced some weeks before it takes place by an increased redness and slight tumefaction of the edges and apices of the gums surrounding it. The dentition of a tooth, whether of the first or second set, is also preceded by similar phenomena in the gum through which it is forcing its way, and these will be more marked as the condition of the system is unhealthy, or as the habit of body is bad.

If the health of the subject continues good, and the teeth be well arranged, and their crowns do not wear off, and the necessary attention to their cleanliness be strictly observed, the characteristics just enumerated will be preserved through life, except

that there will be a slight diminution of colour in them, from after the age of puberty until that of the next climacteric period of life, when they will again assume a somewhat redder appearance. But if the health of the subject becomes impaired, or the teeth be not regularly arranged, or wear off, or be not kept free from all lodgments of extraneous matter, the edges of the gums, and particularly their apices between the teeth, will inflame, swell, and become more than ordinarily sensitive.

The gradual wasting or destruction of the margins of the gums around the necks of the teeth which sometimes takes place in persons of the best constitutions, and is supposed by some writers to be the result of a general atrophy, is ascribable, I have not the least doubt, to some one or other of these causes,—favoured, perhaps, by a diminution of vitality in the teeth, whereby they are rendered more obnoxious to the more sensitive and vascular parts within which their roots are situated. That these are the causes of the affection, (for it is evidently the result of diseased action in the gums,) is rendered more than probable, by the fact, that it never occurs with those, who, from early childhood, have been in the regular and constant habit of thoroughly cleansing their teeth from four to five times a day.

Mr. Bell, however, while he thinks it may occasionally be an “indication of a sort of premature old age,” does not believe it can “always be thus accounted for, as it is sometimes seen in young persons,” and “doubtless arises,” he says, “from the same cause as those presently to be considered,” (alluding to what he afterwards says upon the same subject,) “as originating a similar loss of substance in these parts, when attended with more or less of diseased action.” I cannot, for reasons that have been already assigned, concur with him in opinion that it “occasionally takes place without any obvious local or constitutional morbid action.”

Although possessed, as those, in the larger number of cases are, whose gums are such as I have just described, with the best of constitutions; they may, by intemperance, debauchery, or long privation of the necessary comforts of life, or protracted febrile or other severe kinds of disease, have their assimilative and all their other organs so enervated, as to render every part of the

body highly susceptible to morbid impressions of every sort, but still, this general functional derangement, rarely predisposes the structure now under consideration, to any of the more malignant forms of disease that are occasionally known to attack it in subjects possessed of less favourable innate constitutions. The margins of the gums may inflame, become turgid, ulcerate, and recede from the necks of the teeth, and the whole of their substance be involved in an unhealthy action, but they will seldom be attacked with seirrhus or fungus tumours, or bad conditioned ulcers, or affected with morbid preternatural prurient growths; and in the treatment of their diseases, we can always form a more favourable prognosis in persons of this description, than those coming into the world with some specific morbid constitutional tendency.

But, the occurrence of severe constitutional disease even in these subjects, is followed by an increased irritability of the gums, so that the slightest cause of local irritation, gives rise to an afflux of blood to and stasis of this fluid in their capillaries.

The teeth of persons thus happily constituted, are endowed with characteristics, such as have been represented as belonging to those of the best quality. They are of a medium size, both in length and volume, of a dull or heavy white, compact in their structure, generally well arranged, and seldom affected with caries.

Another constitution is observed, in which the gums, though partaking somewhat of the characteristics of those just described, yet that differ from them in some particulars. Their colour is of a deeper vermilion; their edges rather thicker, their structure less firm, and their surface is not so rough, but more humid. Their mucous membrane has a more lively and animated appearance. They are rather more sensitive and susceptible to the action of local irritants, and their morbid tendencies are more increased by general organic derangement, than they are in gums possessed of the appearances first mentioned.

Their diseases, though generally easily cured or arrested by proper remedial treatment, are nevertheless more obstinate, and when favoured by disease of the general system, assume a still more aggravated form. Their predisposition, in fact, to disease,

is so much increased by severe and long continued general morbid excitement, and especially during youth, and by febrile or inflammatory affections, or obstructions in the parenchymatous organs, that not only their margins, but their whole substance also, sometimes becomes involved in inflammation, and sponginess, followed by ulceration of their edges, and a recession from the necks of the teeth, which, in consequence, loosen, and often drop out. But gums of this kind, like those first described, seldom grow down upon the crowns of the teeth. Neither are they often attacked with scirrhus or fungus tumours, or any form of disease resulting in sanious or other malignant conditioned ulcers. With diseases of this kind, they are not perhaps ever affected, except in those cases where every part of the body has become exceedingly depraved; and this is an occurrence that happens much less frequently in habits originally good, than in those in whom a specific tendency to such unfavourable morbid constitutional diatheses was primitively implanted in the organization.

The teeth of those whose gums are possessed of this second description of characteristics, if well arranged, and kept constantly clean—and, if the secretions of the mouth be not vitiated by general disease, will, in most cases, maintain their integrity through life.

It is only among sanguinous persons that this description of gums is met with, and the teeth of subjects of this kind are generally of an excellent quality, and though rather more liable to be attacked with caries than those first noticed, it is seldom that they are affected with it.

In sanguino-serous and strumous dispositions, the gums are paler than in either of the preceding, and though their margins are thin and well festooned, they exude, after the twenty-fifth or thirtieth year, a small quantity of muco-purulent matter, which on pressure, sometimes is seen to ooze from between them and the necks of the teeth. Their texture is usually firm, and they are not very liable to become turgid, and they often remain in this condition to a late period of life without undergoing any very perceptible change. Although their connection with the necks of the teeth and alveolar processes appears weak, they rarely separate from them.

In remarking upon individuals having such constitutions, M. Delabarre tells us, that if they "abuse their physical powers," by an injudicious regimen, or too much study, they become enervated and "are subject to chronic sanguinous obstructions of the capillaries of the lungs, and to profuse hemorrhages." Dyspepsia and diseases in which the *primæ viæ* generally, is more or less involved, and chronic hepatitis are not unfrequent, and are indicated by increased irritability, and sometimes a pale yellowish appearance of the gums. In jaundice, the yellow serosity of the blood is very apparent in the capillaries of this structure.

These constitutions are more common to females than males, to the rich than the poor, and to persons of sedentary habits than to those who use invigorating exercises. If at any time during life the health is ameliorated, the gums assume a fresher and redder appearance, and the exudation of mucous-purulent matter, from between their edges and the necks of the teeth ceases.

In mucous dispositions, the gums have a smooth, shining appearance, and are rather more highly coloured than those of the preceding. Their margins, also, are thicker, more flabby, and not so deeply festooned; they are more irritable, and, consequently, more susceptible to morbid impressions.

If to this disposition, there be combined a scorbutic or scrofulous tendency, the gums during early childhood, in subjects, which, from scanty and unwholesome diet, have become greatly debilitated, are liable, besides the ordinary forms of disease that attack them, to another,—characterized by their separation from, and exfoliation of the alveolar processes—accompanied by a constant discharge of sanies. This form of disease, however, though peculiar to childhood, and wholly confined to the indigent, is by no means common.

These constitutions are rarely met with, except among persons who live in cellars, and damp and closely confined rooms in large cities, and in low, damp, and sickly districts of country. The mucous membrane in such subjects is exceedingly irritable, and secretes a large quantity of fluid.

In alluding to this species of disposition, M. Delabarre says, "in children, the skin is ordinarily white and tender; nevertheless,

it is sometimes brown and wrinkled. They are usually fragile and weak; their blood is pale, their nutrition is imperfectly effected. In females, the vertebral column is disposed to curve about the age of puberty, because," says he, "at this period, the vital energies are principally directed towards the uterus, and in consequence, although so very necessary in the osseous system, there they appear to be weak.

"The number of observations that I have collected during my practice in the city, and in several public institutions, have confirmed me in the opinion, that it is in this constitution, especially (alluding to the mucous) that the children of whom I have just spoken, are met with. The *organic life* in them has so little energy, that a local cause on a certain point, operates with greater activity than it would otherwise do, sensibly diminishes the assimilative force of almost all the others. It is also probable, that the development of ganglionic obstructions during dentition, are, many times, owing to the diminution of the sensibility in the lymphatics.

"We may also remark," says he, "that, their skin being very susceptible, the sympathy established between it and the mucus membranes, renders individuals of this kind very liable to contract rheums, and gastric and intestinal affections; they are likewise subject to easy night sweats, and vomitings of a sero-mucous fluid," &c.

But, persons even thus unhappily constituted, do, sometimes, by a change of residence and judicious regimen, acquire tolerably good constitutions. Little advantage, however, is derived from these, unless they are had recourse to before the twenty-fifth or thirtieth year of age, though they may prove beneficial at a much later period.

The gums, in subjects in whom there exists a scorbutic tendency, have a reddish-brown colour; their margins are imperfectly festooned, and thick; their structure rather disposed to become turgid, and ever ready on the presence of the slightest cause of local irritation, to take on a morbid action. When thus excited, the blood accumulates in their vessels,—where, from its highly carbonized state, it gives to the gums a dark, purple, or brown

appearance; they swell, and become spongy and flabby, and bleed from the slightest touch. And to these symptoms, supervene the exhalation of a fœtid odour, the destruction of the bond of union between them and the necks of the teeth, suppuration and recession of their margins from the same,—gradual wasting of the alveolar cavities, the loosening and not unfrequently the entire loss of several or the whole of the teeth. These are the most common results, but sometimes they take on other and more aggravated forms of diseased action. Preternatural prurient growths of their substance, fungus and scirrhus tumours, ichorous and other malignant conditioned ulcers are occasionally met with here, in persons in whom there exists a scorbutic taint.

The occurrence of alveolar abscess in dispositions of this kind is often followed by necrosis and exfoliation of portions of the maxillary bone, and the effects which result to the gums from it are always more pernicious than in habits less depraved.

The development of the morbid changes that take place in this structure, even in subjects of this kind, while their character is influenced, if not determined, by a specific constitutional tendency, are nevertheless referable to an immediate or proximate cause, and, were this the proper place, I could cite numerous cases tending directly to establish this pathological position; but, as this constitutes no part of my present design, I shall content myself with what I have already said.

In scrofulous dispositions the gums have a pale bluish appearance, and when subjected to local irritation, they become flabby, exhale a nauseating odour, detach themselves from the necks of the teeth, and their apices grow down between the teeth. The blood circulates through them languidly, and debility seems to pervade their whole substance. They are exceedingly irritable, and not unfrequently take on aggravated forms of disease, and, as it often happens, to this, as well as to the preceding habit, there are combined tendencies which favour the production of ill-conditioned tumours and ulcers.

The indications furnished by the gums of a mercurial diathesis

in the system, are morbid sensibility, increased vascular and glandular action, foulness, bleeding from the most trifling injuries, pale bluish appearance of their substance, turgidity of the points or apices between the teeth, and sloughing. The effects, however, resulting to these parts from the use of this medicine differ in different individuals according to the general constitutional susceptibility, the quantity taken into the system, and the length of time its use has been continued. In persons of very irritable habits, a single dose will sometimes produce pyalism, and so increase the susceptibility of the gums, that the secretions of the mouth, in their altered state, will at once rouse up a morbid action in them.

The influence of a mercurial diathesis upon these parts, is not unfrequently so great as to result in the loss of the whole of the teeth; but with these effects both the dental and medical practitioner are too familiar to require any further description.

Finally, I would observe, that the indications of the several characteristics to which I have now briefly alluded, may not be correct in every particular, and there are others which I have not mentioned; yet, that they will generally be found so, I am persuaded every one whose attention has been for any considerable length of time particularly directed to the subject, will agree. As a general rule, persons of a full habit, though possessed of mixed temperaments, and in the enjoyment of what is usually called good health, have gums that are well coloured, with rather thick margins, and that are very susceptible to local irritation, and with this description of individuals, inflammation, turgidity, and suppuration of the gums are very common. To prevent this, constant attention to the cleanliness of the teeth is indispensable.

Professor Schill says, the "gum is pale in chlorosis and anæmia; of a purple red colour before an active hemorrhoidal discharge, and in cases of dysmenorrhœa; of a dark red colour, spongy, and bleeding readily in scurvy and diabetes mellitus, and after the use of mercury. Spongy growths indicate caries of the subjacent bone."*

* Outlines of Pathological Semeiology, page 168 of the Select Medical Library edition.

Regular periodical bleedings of the gums in dysmenorrhœa, and particularly in scorbutic and mucous subjects, are not unfrequent, nor in any case where they are in a turgid condition.

Spongy growths of the gums in scorbutic and scrofulous persons, often result from irritation produced by decayed teeth, and are not, therefore, always to be regarded as an indication of caries of the subjacent bone.

Mr. George Waite says, "a change of residence to a damp climate will often rouse up in the gums a great degree of vascularity. In the damp places of England and Ireland, the appearances which the gums present are of a turgid and vascular nature. In the damp countries of France these conditions of the gums run a much greater length from the circumstance of the difference in the constitutions of the two nations. In the damps of Germany and Switzerland, persons also lose their teeth early in life, the climate engenders malaria and low fevers, enfeebles the powers of digestion, and brings on rheumatic affections with languor and general constitutional debility."

Of the correctness of Mr. Waite's observations there can be no question, and they go to establish what has been said in regard to the predisposing cause of disease in the gums,—namely, that the enervation of the vital powers of the body, from whatever cause produced, increases their susceptibility to morbid impressions.

CHAPTER FOURTH.

OF THE PHYSICAL CHARACTERISTICS OF SALIVARY CALCULUS.

THE colour, consistence, and quantity of salivary calculus, or tartar, as it is most commonly called, varies in different temperaments, and upon all of which, the state of the general health exercises a considerable influence. It, therefore, furnishes diagnostics, important both to the physician and dental surgeon. The indications of the characteristics of this substance are in many cases less equivocal than those of the appearances of any other part of the mouth; but, like those of the gums, should not, perhaps, be alone always relied upon. In forming a prognosis, we should not neglect to interrogate every part from which information can be derived concerning the pathognomic condition of the several organs of the body.

Salivary calculus is composed of earthly salts and animal matter. Phosphate of lime and fibrina, or cartilage, are its principal ingredients; a small quantity of animal fat, however, enters into its composition. The relative proportions of its constituents vary according as it is hard or soft, or as the temperament of the individual from whose mouth it is taken, is favourable or unfavourable to health; and hence it is, that the analyses that have been made of it by different chemists differ. No two give the same result.

The black, dry tartar, says M. Delabarre, which is deposited around the necks of the teeth of such only as are possessed of good constitutions, is never in large quantity, is dissolved in muriatic acid with difficulty, while the dry, yellow tartar found upon the teeth of bilious persons dissolves more readily in it; but the soft white tartar, found upon the teeth of individuals of mucous temperaments, he tells us, "is scarcely at all soluble in the acids," but, "is readily dissolved in the alkalies."

All persons are subject to salivary calculus, but not alike; it collects on the teeth of some in much larger quantities than it does on those of others, and its chemical and physical characteristics are exceedingly variable. It is, sometimes, almost wholly composed of calcareous ingredients; at other times, these constitute but about one-half, or little more than one-half of its substance,—the balance being made up of animal matter. Nor is its colour more uniform. Sometimes it is black, at other times, it is of a dark, pale, or yellowish brown, and in some instances it is nearly white. There is also a difference in its density. In the mouths of some persons it has a solidity of texture nearly equal to that of the teeth themselves, while in those of others, it is so soft that it can, with ease, be scraped from the teeth with the thumb or finger nail. The black kind is the hardest, the white the softest, and its density is increased or diminished as it approaches the one or the other of these colours.

Salivary calculus collects in but very small quantities on the teeth of persons possessed of the most perfect constitutions, and, even on these it is seldom found, except on the inner surfaces of the lower incisors next the gums. It is then black, or of a dark brown; very dry, and almost as hard as the teeth, to which it adheres with great tenacity.

It rarely happens that any unpleasant effects arise from the presence of this kind of tartar upon the teeth. The general health is never affected by it, and the only local injury that results from it, is, a slight turgidity of the edges of the gums in immediate contact with it.

The indications, therefore, of this description of tartar are favourable, both with regard to the teeth, gums and organism generally. The teeth upon which it is found are of an excellent quality and rarely affected with caries. They are possessed of those characteristics which have been represented as belonging to the best kind, and teeth of this description are only found among persons of good innate constitutions.

There is another kind of black tartar differing from that which has just been described in many particulars. It is found in the

mouths of those, who, though their innate constitutions were good have nevertheless had their physical powers much enervated by privation of the necessary comforts of life, or disease, or intemperance and debauchery, and most frequently by the last. It is found in large quantities on the teeth opposite the mouths of the salivary ducts; it is exceedingly hard, and is agglutinated so firmly to the organs incrustated in it, that it is with the greatest difficulty that it can be removed from them; it is very black; has a rough and uneven surface; and is covered with a glairy, viscid, and almost insufferably offensive mucus.

The presence of this kind of salivary calculus is attended with very hurtful consequences, not only to the gums, alveolar processes and teeth, but also to the general health. It causes the gums to inflame, swell, suppurate and recede from the teeth,—the alveoli to waste, and the teeth to loosen, and frequently to drop out. The secretions of the mouth are also vitiated by it, and thereby rendered unfit to be taken into the stomach. Hence, as long as it is permitted to remain on the teeth, neither the skill of the physician, nor the best regulated regimen, though they may afford partial and temporary relief, will fully restore to the system its healthy functions.

As this kind of tartar is seldom if ever met with except among persons who have had excellent constitutions, the teeth on which it is deposited are generally sound, and, in this condition, they are often caused, by the effects which it produces upon the gums and alveolar processes, to loosen and drop out. Whole sets of the best constituted teeth, are in this way frequently destroyed.

The dark brown tartar is not as hard as either of the descriptions of black. It sometimes collects in tolerably large quantities on the lower front teeth, and on the first and second superior molares; it is also often found on all the teeth, though not in as great abundance as on these. It does not adhere to the teeth with as much tenacity as either of the preceding kinds, and can therefore, be more easily detached from them. It exhales a more foetid odour than the first, but is less offensive than the second.

The persons most subject to this kind of tartar, are of mixed temperaments,—the sanguinous, however, almost always predominating. They may, perhaps, be denominated sanguino-serous

and bilious. Their physical organization, though not the strongest and most perfect, may, nevertheless, be considered very good. But, being more susceptible to morbid impressions, their general health is less uniform, and more liable to impairment than those possessed of the most perfect constitutions.

The effects arising from accumulations of this description of salivary calculus on the teeth, both local and constitutional, are less hurtful than that last noticed, but like that, it causes the gums to inflame, swell, suppurate, and to retire from and expose the necks of the teeth, the alveoli to waste, the teeth to loosen and sometimes to drop out. A vitiated state of the juices of the mouth, also results from its presence, or rather from the effects which it produces upon the gums and alveolar processes.

Salivary calculus that is of a pale or yellow-brown colour, is of a much softer consistence than that which is dark, and is seldom found upon the teeth of persons, except those of bilious temperaments, or those in whom this disposition preponderates. It has a rough, and for the most part, a dry surface; it is found in large quantities on the teeth opposite the mouths of the salivary ducts, and it sometimes happens that every tooth in the mouth is completely incrustated with it. It contains less of the earthy salts and more of the fibrina and animal fat than that of any of the foregoing descriptions, and from the quantity of vitiated mucus in it and adhering to it, has an exceedingly offensive smell. It is sometimes, though not always, so soft that it can be crumbled between the thumb and finger.

Inflammation, turgescence and suppuration of the gums, inflammation of the alveolo-dental periosteum, the destruction of the sockets and loss of the teeth, and an altered condition of the fluids of the mouth, are among the local effects that arise from the long-continued presence of large collections of this kind of tartar on the teeth. The constitutional effects are not much less pernicious. Indigestion and general derangement of all the assimilative functions, are among the most common. If the deposition be not large, inflammation and sponginess of such parts of the gums as are in immediate contact with it, and fetid breath, are the principal of the unpleasant consequences that are produced by it.

White tartar rarely collects in very large quantities, and though most abundant on the outer surfaces of the first and second superior molares, and the inner surfaces of the lower incisors, it is nevertheless frequently found on all the teeth. Its calcareous ingredients are less abundant than those of any of the preceding descriptions. Fibrina, animal fat, and mucus, constitute considerably more than one-half its substance. It is very soft, seldom exceeding in consistence common cheese curd, and to which in appearance, it bears a considerable resemblance. Although it exerts but little mechanical irritation upon the gums, it notwithstanding, from its acrid qualities, keeps up a constant morbid excitement in them. Its effects, however, upon the teeth, are by far more deleterious than any other description of salivary calculus. It corrodes their enamels, and causes rapid decay of the organs. The fluids of the mouth are also vitiated by it.

It is only upon the teeth of persons of mucous dispositions, or those who have suffered from diseases of the mucus membranes, or those in whom these have been more or less involved, that this kind of tartar accumulates.

There is one other kind of tartar that is described by dental writers. It, however, as I have on another occasion said, is of a dark green colour, and is seen more frequently on the anterior surfaces of the upper teeth occupying the front part of the mouth, than on any of the others. Its resemblance is more that of a stain on the enamel than salivary calculus. Children and young persons are more subject to it than adults, though it is occasionally observed on the teeth of the latter. It is exceedingly acrid, and has the effect of decomposing the enamel; the margins of the gums around the teeth having it on them, are inflamed, and the sanguinous capillaries of their whole substance appear to be distended and more than ordinarily languid.

This kind of discolouration of the enamel is indicative of an irritable condition of the mucus membranes and viscosity of the fluids of the mouth. Sour eructations, vomitings, diarrhœa and dysentery are not unfrequent with those whose teeth are thus affected.

CHAPTER FIFTH.

OF THE PHYSICAL CHARACTERISTICS OF THE FLUIDS OF THE MOUTH.

IN treating upon the physical characteristics of the fluids of the mouth, it will not be necessary to dwell at much length on the effects produced by them, when in a morbid condition, on other parts. Concerning their agency in the production of caries of the teeth, I shall add one or two more remarks.

The saliva, in healthy persons, having good constitutions, has a light, frothy appearance, and but very little viscosity. Inflammation of the gums, from whatever cause produced, increases its viscosity, and causes it to be less frothy. In a healthy state, it is inodorous, floats upon and mixes readily with water, but when in a viscid or diseased condition, it sinks and mixes with it with difficulty.

Irritation in the mouth, from diseased gums, aphtheous ulcers, inflammation of its mucus membrane, the introduction of mercury into the system, or the taking of any thing pungent into it, increases the flow of this fluid, and causes it to be more viscid than it is in its natural and healthy state.

In treating on the signs of the saliva, Professor Schill, says, "The sympathetic affection of the stomach in pregnancy is sometimes accompanied by salivation, which in this case mostly takes place after conception, and sometimes continues to the time of delivery. It is also observed to occur in weakened digestion, in gastric catarrhs, after the use of emetics, in mania, in what are called abdominal obstructions, in hypochondriasis and hysteria; salivation occurs during the use of mercury or antimony.

"In confluent small-pox, salivation is a favourable sign. If it

cease before the ninth day the prognosis is bad. In lingering intermittents, salivation is sometimes critical; more frequently in these affections it precedes the termination in dropsy.

"Diminution of the salivary secretion, and, in consequence of this, dryness of the mouth, is peculiar to the commencement of acute diseases, as also to the hectic fevers occasioned by affections of the abdominal organs. If the flow of the saliva stop suddenly, there is reason to apprehend an affection of the brain.

"Thick viscid saliva occurs under the same circumstances as the diminution of the salivary secretion, especially in small-pox, typhus, and in hectic fevers. It is thin in ptyalism. In gastric diseases where the liver participates, it becomes yellow or green; by the admixture of blood it may assume a reddish colour; in pregnant or lying-in-women, it is sometimes milky; an icy cold saliva was observed by the author in face-ache.

"Frothy saliva from the mouth is observed in apoplexy, epilepsy, hydrophobia, and in the hysterical paroxysm."*

Dr. Bell, editor of the Select Medical Library and Bulletin of Medical Science, in a note to the work from which I have just quoted, says, "acid saliva is regarded by M. Donné, as indicative of gastritis, or deranged digestion. Mr. Laycock," he observes, "on the other hand, infers from numerous experiments on hospital patients, that the saliva may be acid, alkaline, or neutral, when the gastric phenomena are the same. In general, Mr. L. remarked, that it was alkaline in the morning, and acid in the evening."

I have had occasion to observe, that the acid quality of the saliva was more apparent, and more common in lymphatic, mucous and bilious dispositions, than in sanguinous or in sanguiniferous persons, and that weakened or impaired digestion always had a tendency to increase it.

M. Delabarre, says, "When this fluid," (the saliva,) "has remained in the mouth some moments, it there obtains new properties, according to each individual's constitution and the integrity of the mucus membrane, or some of the parts which it covers.

*Outlines of Pathological Semeiology; edition of the Select Medical Library, pp. 173-4.

“In subjects who enjoy the best health, whose stomach and lungs are unimpaired, the saliva appears very scarce, but this is because it passes into the stomach almost as soon as it is furnished by the glands that secrete it. It only remains long enough in the mouth, to mix with a small quantity of mucus, and absorb a certain portion of atmospheric air, to render it frothy.

“On the other hand, the saliva of an individual, whose mucous system furnishes a large quantity of mucus, is stringy and heavy; is but slightly charged with oxygen, contains a great proportion of azote and sulphur, and stains silver.”*

Increased redness and irritability of the mucus membrane of the mouth, is an almost invariable accompaniment of general acidity of these fluids. Excoriation and aphtheous ulcers of it, and bleeding of the gums also frequently result from this condition of the salivary and mucus juices of this cavity.

Anorexia, languor, general depression of spirits, head-ache, diarrhœa, and rapid decay of the teeth, are very common among persons habitually subject to great viscosity of the buccal fluids. It is likewise among subjects of this kind, and particularly when the viscosity is so great as to cause clamminess of these juices, that the green discolouration of the enamel of the teeth, is most frequently met with.

*Vide, *Traite de la Seconde Dentition*.

CHAPTER SIXTH.

OF THE PHYSICAL CHARACTERISTICS OF THE LIPS.

THE indications of the physical characteristics of the lips are more general than local, and the observations of Laforgue and Delabarre on this subject, leave little to be added. I cannot therefore, do much more than repeat what they have said.

“The lips,” says Delabarre, “present marked differences in different constitutions. They are thick, red, rosy or pale, according to the qualities of the arterial blood that circulates through their arteries.”

Firmness of the lips, and a pale rose-colour of the mucous membrane that covers them, are, according to Laforgue, indicative of pure blood, and as a consequence, of a good constitution. Redness of the lips, deeper than that of the pale rose, is mentioned by him, as one of the signs of sanguino-serous blood. Soft, pale lips are indicative of lymphatico-serous dispositions. In these subjects the lips are almost entirely without colour. When there is a sufficiency of blood the lips are firm, though variable in colour, according to the predominancy of the red or serous parts of this fluid.

Both hardness and redness of the lips and all the soft parts of the mouth, are enumerated among the signs of plethora. Softness of the lips, without change of colour in their mucus membrane, is spoken of by this last author as indicative of deficiency of blood; and, softness and redness of the mucus membrane of the lips are signs that the blood is small in quantity and sanguino-serous.

Serous *emie* and pale blood are indicated by want of colour

and softness of the lips, and general paleness of the mucus membrane of the whole mouth.

"The fluids contained in the vessels," says Laforgue, in the three foregoing forms of eczema, "yield to the slightest pressure, and leave nothing between the fingers but the skin and cellular tissue."

In remarking upon the signs of the different qualities of the blood, the above mentioned author asserts that the constitution of children, about the age of six years, cannot, by a universal characteristic, be distinguished, but that the lips, as well as other parts of the mouth constantly betoken the "quality of the blood and that of the flesh;" and, "consequently, they proclaim health or disease, or the approach of asthenic and adynamic disorders, which the blood either causes or aggravates."

Again, he observes that the blood of all children is "superabundantly serous," but that it is redder in those of the second constitution than it is in those of any of the others; and that this is more distinctly indicated by the colour of the lips. "This quality of the blood," says he, "is necessary to dispose all the parts to elongate in their growth. When the proportions of the constituent elements of the blood are just, growth is accomplished without disease. If the proportions are otherwise, then they should be for the preservation of the health, or if one or more of its elements be altered, health no longer exists, growth is arrested altogether, or is performed irregularly. The nutritive matter is imperfect,—assimilation is prevented or impaired. On the other hand, disintegration decomposes the patient; if death does not sooner result, it will consume him by the lesion of some vital organ."*

To the correctness of the foregoing observations, every experienced and inquiring dental practitioner can bear witness. The changes produced in the colour of the blood by organic derangements are at once indicated by the colour of the lips.

The accuracy of Laforgue's observations on the indications of the physical characteristics of the lips has been fully confirmed

*Vide, *Sémiologie Buccale et Buccamancie*.

by subsequent writers. Delabarre, in his remarks on the semeiology of the mouth, has added nothing to them.

"The secretion of the lips," says Professor Schill, "has a similar diagnostic and prognostic import to that of the tongue and gums. They become dry in all fevers and in spasmodic paroxysms. A mucous white coating is a sign of irritation or inflammation of the intestinal canal; accordingly, this coating is found in mucous obstructions, in gastric intermittent fever, in mucous fever, and before the gouty paroxysm. A dry brown coating of the lips is a sign of colliquation in consequence of typhus affection; it is accordingly observed in typhus, in putrid fever, in acute exanthems, and inflammations which have become nervous."*

The appearance of the lips, however, do not present so great a variety as those of other parts of the mouth, for the reason that they are not as subject to local diseases, but their general pathognomic indications, are, perhaps, quite as decided.

* Vide, *Pathological Semeiology*, p. 152.

CHAPTER SEVENTH.

OF THE PHYSICAL CHARACTERISTICS OF THE TONGUE.

THE appearances of the tongue, both in health and disease, are regarded by physicians as furnishing more correct indications of the state of the constitution and general health, than those of any of the other parts of the mouth. It is asserted, however, by others, and those, too, who have the very best opportunities for inspecting the various parts of this cavity, that the lips and gums furnish as plain and decided indications as the tongue. That the state and quality of the blood can be as readily ascertained by an examination of these, as by that of the tongue, is, I believe, undeniable, but that the pathological condition of the body can be, is a question which I shall leave for others to decide.

So far as the quality of the blood and the temperament of the subject are indicated by the colour of the tongue, the remarks that have been made concerning that of the lips will be found applicable here. For, that of the one, is as much influenced by them as is that of the other. It will, therefore, be unnecessary to recapitulate what I have before said.

The effects produced on the mucus membrane of the tongue, by disease in another part, are said to be analogous to those produced on the general integument. So, also, are the changes of its colour, consistence, humidity and temperature similar to those of the skin. We are likewise told that the changes of the coating of it agree with analogous changes of the perspiration, and that these phenomena are more decided in acute than in chronic affections.*

But the diagnostic and prognostic indications of the tongue, vary according to the temperament and constitutional predisposi-

* Vide, Professor Schill's Semeiology.

tion of the individual. The physician, therefore, should acquaint himself with its appearances in health, to be enabled to determine correctly its indications in disease. He should likewise inform himself of the changes that are produced in its appearance by certain morbid conditions of the body. In some subjects it is always slightly furred, especially near its root, and rather dry; in others it is always clean and humid; in some again, it is always red, and in others pale.

Professor Schill divides the signs of the tongue into objective and subjective. To the objective, "the changes of size, form, consistence, colour, temperature, secretion," and those of its "motion belong;" and "to the subjective, the anomalous sensations of taste." I do not know, however, that any advantage can be derived from this classification.

In enumerating the pathognomic signs of the tongue, this author says that hypertrophy, inflammation or congestion, may occasion its enlargement; and that inflammatory swelling of it, when arising from acute diseases, such as "angina, pulmonary inflammation, measles, plague, or variola, yields an unfavourable prognosis. Even non-inflammatory swelling of the tongue, is a dangerous phenomenon, in acute diseases, especially cerebral, which are combined with coma. If it be the consequence of mercury, of the abuse of spirituous drinks, of gastric inflammation, of chlorosis, of syphilis, or if it occur in hysteria or epilepsy, the prognosis is not dangerous; but the disease is always the more tedious where the tongue swells than where it does not. It is enlarged, also, by degenerescence and cancer."

"Diminution of the size of the tongue takes place where there is considerable emaciation. In this case it continues soft and moveable. If, in acute states, the tongue becomes small, and is, at the same time, hard, retracted and pointed, the irritation is very great, and the prognosis bad. This sign occurs more especially in typhus, in the oriental cholera, in inflammation of the lungs, and in acute cerebral affections. In hysteria and epilepsy, this phenomenon has no unfavourable import."

Internal maladies, he says, seldom cause the form of the tongue to change, but, that the slightest change arising from chronic irri-

tations of the stomach, chronic dyspepsia, and acute exanthems, is enlargement of its papillæ. In cases of protracted dyspepsia, the edges of the tongue sometimes crack, and in paralysis and epilepsy, it becomes elongated.

In acute diseases, a soft tongue is a favourable indication, and flaccidity of it, that of debility.

Humidity of the tongue, he tells us, is a favourable sign, and that dryness of it occurs in acute or violent inflammations and irritations, and more particularly when seated in the intestinal canal, and respiratory organs, as in the case of diarrhœa, typhus, pneumonia, gangrene of the lung, pleuritis, peritonitis, enteritis, catarrhus gastricus, gastritis, inflammation of joints, &c. Among the higher degrees of dryness, he enumerates the rough, the fissured and burnt tongue, as furnishing still more unfavourable indications, informing us at the same time, that if these be not accompanied by thirst, they prognosticate a fatal termination. The abatement and crisis of the disease is indicated by the tongue's becoming moist.

Dr. Bell, of Philadelphia, in a note to Professor Sehill's observations on the tongue, says, "a rough, and dry, and even furred tongue, is seen in some dyspeptic persons, who sleep with the mouth open; and although it indicates an irritation of the digestive organs, it is not of a bad augury." Bilious persons, not unfrequently, though not troubled with any manifest symptoms of gastric or intestinal derangement, or any other apparent functional disturbance, have a furred tongue in the morning.

Paleness of the tongue, we are told by Professor Sehill, is a sign of a serous condition of the blood, of chlorosis, of great loss of blood, of chronic disorders, of sinking of the strength in acute maladies, assuming a "nervous form, as typhus and scarlatina maligna. It is also found," says he, "in enteritis and dysentery, when but little fever is present." He infers from this, that paleness of the tongue is caused by the "drawing of the fluids downwards," but it is often observed in persons who enjoy tolerably good health. Lymphatic dispositions, as has been before remarked, are peculiarly subject to it.

Again he observes, that a very red tongue is indicative of "violent inflammation, mostly of the intestinal canal, but also of the lungs and of the pharynx and acute exanthems." He regards the prognosis as bad, when a furred tongue "in acute diseases of the intestinal canal becomes clean and very red," if the change be not accompanied with the return of the patient's strength. "But," he continues, "if the debility is not considerable, and the tongue becomes clean and very red, whilst other febrile symptoms continue, a new inflammation may be expected." But, even in affections like these, the redness of the tongue is always more considerable in sanguinous, than it is in lymphatic or lymphatico-serous subjects, so that in forming a prognosis from this sign, the temperament of the individual should never be overlooked.

Proceeding with the description of the signs of this organ, he says, "the tongue becomes a blackish-red and bluish-red in all serious disturbances of the circulation and respiration, as also in severe diseases of the lungs and heart, as catarrhs, suffocations, asthma, extensive inflammations of the lungs, carditis, Asiatic cholera, plague, confluent small-pox, and putrid fevers. It becomes black and livid in cases of vitiation of the blood, more especially in scurvy, at the setting in of gangrene, and in phthisis, when death is near at hand."

Among the diseases mentioned as giving rise to an increase of the temperature of the tongue are glossitis, violent internal inflammation and typhus; and, coldness of this organ, is observed to take place in Asiatic cholera, and at the approach of death.

The signs from the secretion of the tongue are thus enumerated. A clean and moist tongue are favourable indications, but a clean, dry and red tongue, as are seen in slow nervous fevers, acute exanthems and plague, are bad auguries. A furred or coated tongue is said to occur chiefly, in intestinal disorders, diseases of the lungs, skin, and in rheumatic affections. The coating is said to vary in "colour, thickness, adherence, and extent," and different kinds of secretion from the mucous membrane of this organ are mentioned as occurring in different diseases, and it should have been added in the same disease in different temperaments.

After describing the various kinds of coating on the tongue, together with their respective indications, which it is not necessary here to enumerate, the occurrence of false membranes and pustules, resulting from peculiar forms of mucous secretion are next mentioned. The former show themselves either as small white points, or large portions, and sometimes they are said to envelope the whole tongue. Their colour is "sometimes white, sometimes yellow and sometimes red," and the greater the surface covered by them, the more unfavourable is the prognosis regarded. "Pustules on the tongue," says our author, "are sometimes idiopathic, but in most cases symptomatic. They are either distinct or confluent; the confluent are the worst. Those which are hardish and dry, and also those which are blue, and those of a blackish appearance, which sometimes occur in acute diseases, are of an unfavourable import." On the other hand, those which have a whitish, soft, moist and semi-transparent appearance, are less unfavourable, and when the eruption or aphthæ is repeated, it portends a longer continuance of the malady. To the following diseases, they are mentioned as being frequent accompaniments; namely, gastritis, catarrhs, enteritis, metritis, dysentery, cholera infantum, peritonitis, intermittent and typhus fevers, pleuritis, pneumonia, and the third stage of pulmonary consumption. Their prognosis is said to be favourable, when "they appear with critical discharges after the seventh day," and unfavourable, when they occur as a consequence of a general sinking of the physical powers of the body.*

But it is unnecessary to enumerate all of the pathognomic indications of the various morbid phenomena that have been described by semeiologists, I have already noticed more of them, than it was my intention at first to have done, I shall, therefore, conclude the present inquiry, by simply observing, that the indications furnished by the physical characteristics, of not only the tongue, but those also, of the teeth, the gums, salivary calculus, the lips and fluids of the mouth, are, as I have here endeavoured to show, essential to the successful exercise of the duties both of the dental and medical practitioner.

* Vide, Professor Schill's Semeiology.

PART THIRD.



DISEASES OF THE TEETH

AND

THEIR TREATMENT.

PART THIRD.

DISEASES OF THE TEETH.

THE doctrine that the diseases of the teeth are the same as those which attack the other osseous structures of the body, as promulgated by Fox, and subsequently advocated by Bell, Jobson and other European writers, is now almost universally conceded to be incorrect. With the exception of exostosis and necrosis, the diseases of these organs do not bear the slightest analogy to those of other bones. They do not result from the same causes, nor can they be cured by the same remedies. In the treatment of those of the former, art must do all, in that of the latter, the recuperative powers of the economy, are the resources principally to be relied on.

CHAPTER FIRST.

OF CARIES.

THERE is no disease to which the teeth are liable, more frequent in its occurrence, or fatal in its tendency, than caries. It is often so insidious in its attacks, and rapid in its progress, that whole sets are frequently involved in irreparable ruin, before its existence is scarcely suspected.

Its presence is usually first indicated by an opaque or dark spot on the enamel; and, if this be removed, the subjacent bone will exhibit a black, dark-brown, or whitish appearance. It always commences on the exterior surface of the tooth, and most frequently under the enamel; from thence it proceeds towards the centre, until it reaches the pulp cavity.

If the diseased part is of a soft and humid character, the enamel, after a time, usually breaks in, disclosing the ravages which it has made on the subjacent bone. But this does not always happen; it sometimes remains nearly perfect, until the whole interior structure of the tooth is destroyed.

There is no portion of the crown or neck of a tooth exempt from the disease; yet, there are parts more liable to be first attacked by it than others; as for example, the depressions on the grinding surfaces of the molares and bicuspidés, the lateral or approximal sides of all the teeth,—the posterior or palatine surfaces of the lateral incisors; and in short, wherever an imperfection exists in the enamel.

The outer portion of a tooth, as has been stated in a preceding place, is much harder than the inner or osseous part, and is by far less easily acted upon by the causes that produce the disease. It is, however, notwithstanding, occasionally affected by it, but

more frequently on the anterior or labial surfaces of the teeth, near the gums, than any other part; sometimes commencing at a single point, and at other times at a number of points. When it attacks the enamel first, it is usually called erosion; but here, there not being so much animal matter as in the subjacent osseous structure, the diseased part is washed away by the saliva of the mouth, while in the bony part of the tooth, it, in most instances, remains, and may be removed in distinct lamina, after the calcareous molecules have been decomposed.

In teeth that are very hard, the decayed part is of a much firmer consistence, and of a darker colour. Sometimes it is black; at other times of a dark or light brown; and at other times again, it is nearly white. As a general rule, the softer the tooth the lighter, softer, and more humid the decay. The colour of the decayed part, however, may be, and doubtless is, in some cases, influenced by other circumstances,—perhaps by some peculiar modification of the agents, upon the presence of which, the disease is dependent.

The disease then, not being the result of any vital action of the organs themselves, the applicability of the term caries may be questioned; but, as it has been very generally sanctioned, and I know none better, I shall continue its use. Mr. Bell has substituted the term gangrene, under the belief that it conveys a more correct idea of the true nature of the disease. The applicability of a term, regarded as almost synonymous with this, is also suggested by Mr. Hunter; who, in speaking of the affection, says, it “appears to deserve the name of mortification.” Mr. Fox, too, speaks of the decay of the teeth, as a disorder which terminates in mortification, but while treating of it, he designates it by the name of caries. And this term, I prefer, inasmuch as that of gangrene or mortification, may be applied to another condition of the teeth; namely, necrosis, with as much propriety as to the one now under consideration. Moreover, the term gangrene, or mortification, is usually used to signify the death of a soft part, not a diseased condition of an osseous tissue.

Commencing externally, the disease proceeds, as I have before stated, towards the centre of the tooth, destroying layer after layer,

until it reaches the lining membrane, and leaving the outer strata softer, and of a darker colour than the inner.

The appellations, deep seated, superficial, external and internal, simple and complicated, have been applied by some writers to this disease. These distinctions are unnecessary, since they only designate the different stages of the same disease. By complicated decay, is meant a caries that has penetrated to the pulp cavity of the tooth, and is accompanied by an inflammation of the lining membrane, that terminates in suppuration, and thus occasions the death of the organ. The lining membrane, however, is not always inflamed by exposure, nor suppurated by inflammation.

And equally unnecessary is the classification adopted by M. Duval, to designate the differences of colour and consistence exhibited by the decayed part. He enumerates seven varieties or species, which are as follows: calcareous, peeling, perforating, black, deruptive, stationary, and wasting.

The first, he employs to denote that affection of the teeth which is characterized by the appearance of a white opaque spot on the enamel, whereby it is rendered brittle, and oftentimes caused to break. The second, if not identical with, is at least analogous to the first,—the difference only consisting in the colour of the enamel. The third, from a defect in almost every part of the enamel covering the crowns of the teeth, attacks the molares and sometimes the bicuspidæ, at a number of points simultaneously, causing the speedy destruction of the organs. The fourth, he describes as not occurring until from the fifteenth to the thirtieth year, and as being principally confined to persons of a consumptive habit, and those disposed to rachitis. The decay of the teeth of individuals of these habits is sometimes black, but it is more frequently white. Black caries, as it is called, is oftener met with, in the teeth of persons of good constitutions, and, as has previously been remarked, in hard than in soft teeth.

The fifth species, or deruptive, he represents as that, which attacks the front teeth of individuals of consumptive habits near the necks of the organs extending downwards towards their roots, and forming a brownish semicircular groove. The sixth, is that

description, which after having penetrated a certain distance into the substance of the tooth, becomes stationary. The seventh and last species, is that which is characterized by the gradual wasting of the grinding surfaces of the molares, dipping down in some places to a considerable depth, and having a smooth polished surface of a brown or yellowish colour.

Finally, the roots of the teeth frequently remain firm in their sockets for years after their crowns and necks have been destroyed. The roots are less liable to decay than the crowns, but nature, after the destruction of the last, as if conscious that the former are of no further use, exerts herself for their expulsion, which is effected by the gradual wasting and filling up of their sockets. It often happens, that after this operation of the economy has been accomplished, they are retained in the mouth for months, and oftentimes for years, by their periostial connection with the gums. But this effort of nature, for the removal of the roots of the teeth after their crowns have been destroyed by decay, is confined more to the back than to the front teeth, for it often happens that these last remain for a great number of years, and seemingly without much injury to the parts within which they are contained.

OF THE DIFFERENCES IN THE LIABILITY OF DIFFERENT TEETH TO DECAY.

Having explained at some length in a preceding part of this work, the manner in which the physical condition of the teeth is influenced, it will not be necessary now to dwell long upon this portion of the subject. It will therefore, only be requisite to state, that teeth that are well formed, well arranged, and of a firm texture, seldom decay, or if they do, they do so very slowly: whereas, those that are imperfect in their formation, or improperly situated, decay both easily and rapidly. And, just in proportion as the osseous structure of the teeth is hard or soft, their shape perfect or imperfect, their arrangement regular or irregular, is their liability to caries diminished or increased.

The density, shape, and arrangement of the teeth, are influ-

enced by the state of the general system and mouth, during the time of their ossification. If, at this period, all the functions of the body are healthily performed, these organs will be compact in their structure, perfect in their shape, and regular in their arrangement. But, if on the other hand, the body, or any part of it, and especially the mouth, be morbidly affected, the teeth will be more or less imperfect, and consequently less capable, than they otherwise would be, of resisting the usual causes of decay, to which all teeth are necessarily exposed.

That the teeth should be thus influenced, will not appear strange, when we consider, that "there exists," as Richerand remarks, "amongst all the parts of the living body, intimate relations, all of which correspond to each other, and carry on a reciprocal intercourse of sensations and affections." Hence, if there is a morbid action in one part, other parts sympathize with it, and, as if sensible of the mutual dependence that there is between them, rally all their energies, to rescue their neighbour from the power of disease.

An increased action in one portion of the system, is generally followed by a diminished one in some other part; thus, for instance, gastritis is usually produced by a constipation of the bowels: puerperal fever, by a diminished action in the heart, and an increased action in the uterus, &c. Whence, we may conclude, that if the body, at an early age, be morbidly stimulated, its functions will be languidly performed—the process of assimilation checked—the regular and healthy supply of bony matter, stopped—and that, consequently, the teeth which are then formed, will be defective. Other parts of the body, as has been before stated, in which constant changes are going on, if thus affected at these early periods, may afterwards recover their healthy energies; but if the teeth are badly formed, they must ever after, because of their low degree of organization, continue so, and, consequently, be more liable to decay than those that are perfect.

"That the teeth acquire this disposition," says Mr. Fox, "to decay, from some want of healthy action during their formation, seems to be proved by the common observation, that they become decayed in pairs; that is, those which are formed at the same time, being in a similar state of imperfection, have not the power

to resist the causes of the disease, and therefore, nearly about the same period of time, exhibit signs of decay ; while those which have been formed at another time, when a more healthy action has existed, have remained perfectly sound to the end of life."

Most writers are of the opinion, that the power of the teeth to resist the various causes of decay, is sometimes weakened by a change brought about in their physical condition through the agency of certain remote causes, such as the profuse administration of mercury, the existence of fevers, and all severe constitutional disorders.

Mr. Fox tells us, "That he has had occasion to observe, that great changes take place in the economy of the teeth in consequence of continued fever; and that the decay of the teeth is often the consequence of certain states of the constitution."

Mr. Bell remarks ; "That amongst the remote causes, (of decay,) are those which produce a deleterious change in the constitution of the teeth, subsequent to their formation, one of the most extensive in its effects is the use of mercury. To the profuse administration of this remedy in tropical diseases, we may, I think, in a great measure, attribute the injury which a residence in hot climates so frequently inflicts on the teeth."

Severe constitutional disorders, and the administration of certain kinds of medicine, do not, as Mr. Fox and Mr. Bell suppose, act directly upon the teeth, by altering their physical condition and thus rendering them more liable to disease ; but they exert an indirect influence upon them, by so vitiating the secretions of the mouth, as to cause them to act on them.

The following considerations establish, to my mind, the truth of what I have just stated. Artificial teeth of bone or ivory, which can undergo no such changes as those mentioned by Mr. Bell, decay more rapidly after the profuse administration of any medicine, or during the existence of any disease, that tends to vitiate the secretions of the mouth. Furthermore, teeth that are of so dense a texture, that they are capable of resisting the action of the corrupt juices of the mouth,—though just as liable as those that are of a spongy nature, to any disease that can be communi-

cated to them, from the general system, by means of their internal economy,—are not affected by any disease of the general system, nor by any action that has been produced in it by mercurial medicines.

My own observations give the following result: The gums and alveolar processes are sometimes destroyed by the use of mercury, while all the teeth loosen and drop out, without being at all decayed. The teeth of persons, in whom a mercurial diathesis has been for a long time kept up, or who have been for years suffering from dyspepsia, phthisis, fevers, or other severe constitutional disorders, often continue to be perfectly sound, while other teeth, in similar situations, frequently decay. Now, all this goes to prove, not that changes are effected in the organization of the teeth, whereby their predisposition to decay is increased, but that there are differences in the capabilities of different teeth, to resist the acrid secretions of the mouth, to which such affections as have just been enumerated, always give rise.

The predisposition to decay, may however, be increased by improper dental operations, as injudicious filing, careless plugging, &c.

I am aware that I differ with most of my professional brethren on this point, as well as from received popular opinion. The views that I have here presented, are not the result of mere closet reflections partially matured, but of long and attentive observation. I have noted the effects of mercury, and of other sorts of medicines, as well as of constitutional diseases, of the severest and most protracted kinds; and I have always observed, that it was only as they impaired the healthy qualities of the juices of the mouth, that they affected the teeth. In fact, the density of the structure of these organs, their exposed situation, their functions, all would seem to indicate, that such changes in them, as take place in other parts of the body, are not only unnecessary, but even impossible.

Dr. Good says, "That caries of the teeth does not appear to be a disease of any particular age or temperament, or state of health."

It is not a disease of any particular state of health, farther than that certain disorders exert a deleterious influence upon the secretions of the mouth, and thus become indirect causes of the decay of the teeth. That it is not a disease of any particular age, seems to contradict common experience, for it rarely happens, that caries appears after the age of forty. The reason of which is obvious. Teeth that are of a loose texture, or otherwise imperfect, are unable so long to resist the causes of decay, to which all teeth are more or less exposed, while those that are able to resist thus long, are generally enabled, by the increased density they gradually acquire, to resist them through life. Teeth, however, do sometimes, though rarely, decay at fifty, or even at a later period of life. But caries of the teeth generally, may be said to be confined to youth and middle age.

The formation, arrangement, and physical condition of the teeth, are sometimes influenced by a hereditary diathesis of the general system, or of the parts concerned in their production. That a morbid condition of the system, either on the part of the father or mother, often predisposes their progeny to like affections, is a principle fully recognized by pathology, and a fact of which we have many fearful proofs.

Mr. Bell, in treating of what he calls the hereditary predisposition of the teeth to decay, remarks: "That it often happens that this tendency exists in either the whole or a great part of a family of children, where one of the parents had been similarly affected; and this is true to so great an extent, that I have commonly seen the same tooth, and even the same part of a tooth, affected in several individuals of the family, and at about the same age. In other instances where there are many children, amongst whom there existed a distinct division into two portions, some resembling the father, and some the mother, in features and constitution, I have observed the corresponding differences in the teeth, both as it regards their form and texture, and their tendency to decay."

Conclusive proofs, that there is an hereditary tendency in the teeth to decay, are almost daily presented to the dental practitioner. Yet, I think it is occasioned, not by the transmission from the parent to the child, of any peculiarity of action in the

teeth themselves, but of a similarity of action in the parts concerned in their production, so that the teeth of the child are, in form and structure, like those of the parent whom it most resembles, and from whom it has inherited the diathesis. The teeth of the child, being thus shaped like those of the parent, possessed of a like degree of density, and, in most instances, similarly arranged, are equally liable to disease as they, when exposed to the action of the same causes; and are affected in a like manner, and generally at about the same period of life. Such being the fact is it unreasonable to conclude, that judicious and early attention may so influence the formation and arrangement of the teeth, that their liability to disease may be greatly diminished?

CAUSES OF CARIES.

Until very recently, inflammation of the osseous structure of the teeth was generally considered as the immediate cause of the decay of these organs. This hypothesis, for it cannot be regarded as any thing else, was predicated on the vascularity of the teeth, and supposed, by its advocates, to constitute the basis of the established treatment of the disease.

That the teeth are endowed with blood vessels, nerves, &c., and are capable of being inflamed, is susceptible of the clearest demonstration; but, so far from the present established practice being in accordance with the supposition above named, it is directly opposed to it.

For were the hypothesis correct, the treatment that is now generally pursued, so far from arresting the disease, would only tend to increase it. Thus, for instance, the operations of filing and plugging, if well performed, usually arrest the progress of caries, and yet they always augment the sensibility of the teeth and their susceptibility to the action of heat and cold, which are usually considered as exciting causes of inflammation.

Long continued inflammation of the lining membrane of a tooth, may end in its entire death, but I cannot believe that inflammation of its osseous structure alone, causes a decomposition of any portion of its substance. For were such a change produced by any vital action in it, the part thus deprived of vitality, would be

exfoliated and its loss repaired by the formation of new bone, which never happens; and hence, I am led to conclude that the vital powers of the teeth are too weak for the decomposition, exfoliation, or restoration of any portion of their substance. Were their living powers more active, it is probable that their diseases would be more analogous to those of other bones.

If the decay of the teeth then, is not referable to inflammation in their bony structure, to what is it to be ascribed? The inference is, that it is the result of the action of chemical agents, and when we take into consideration that the fluids of the mouth, when in a morbid condition, are capable of decomposing their enamels, if not possessed of more than ordinary density, and that the disease frequently commences upon this outer covering, the conclusion is at once irresistible. A most remarkable case of this description of caries, (called by Mr. Hunter, "*decay by denudation*,") is mentioned by Dr. Eleazar Parmly, in his notes to that gentleman's treatise on the teeth, published in the American Library of Dental Science, in which the labial faces of several natural teeth, that had been artificially placed in the mouth, were attacked by it.

It may, however, be asked, if caries of the teeth be produced by the action of external corrosive agents, how is it that the disease sometimes commences within the bony structure of the organs, and makes considerable progress there, before any indications of its existence are observed externally? I answer, that it never does commence within the bony structure of the organs; its attacks, as I have before remarked, are always upon their external surfaces, sometimes upon the enamel, but most frequently upon the bone within the indentations on the grinding faces of the bicuspidæ and molares, and on the approximal sides of the teeth where this outer covering is frequently so fractured by the pressure that is exerted upon it, that the juices of the mouth find ready access to the subjacent osseous tissue. The destruction of the organs may be gradually going on here for months and even years without any notable signs of its existence; and the commencement of the disease in these places has led many to suppose that it had its origin within their osseous structure.

A thorough investigation of this subject, would, I should suppose, convince any one, that caries always commences externally. If it commenced in the interior or within the bony substance, as is asserted by some English writers, "the sphere of usefulness," as is very justly remarked by Dr. Fitch, "on the part of the surgeon dentist," would be, "to say the least of it, extremely limited. For if their observations," alluding to those of Hunter, Fox, Koecker and other European writers, "are true, this disease, in its commencement, in one-half of the cases, is entirely out of the reach of medical aid." Dr. F., however, is of the opinion that it does sometimes commence within the substance of the tooth.

But a still more absurd and ridiculous theory in regard to the cause of the disease is advanced by Mr. Charles Bew. He attributes it to the arrest of the circulation in the organs, "by the lateral pressure of the teeth against each other."

The exposure of the teeth too, to sudden changes of temperature, as from heat to cold, or cold to heat, has been regarded almost from time immemorial as a cause of their decay, but no explanation of the manner by which it produced the disease was attempted, until the promulgation of the doctrine that it was the result of inflammation, when it was numbered among, only the *exciting causes*. The popular belief that cold is a cause of dental caries, is traced back to Hippocrates, who, in mentioning the parts of the body that are injuriously affected by it, includes the teeth.*

M. Ribe endeavours to prove that hot food is a cause of caries; because "man is the only animal accustomed to hot food, and almost the only animal affected with carious teeth." Had he instituted a comparison between the teeth of man and of brutes, and between the solvent agents to which they are respectively exposed, he might have traced the decay of the human teeth to its proper cause.

"The Indians of North America," remarks M. Tillæus, "knew nothing of the inconvenience of carious teeth and debili-

* *Frigidum inimicum ossibus, dentibus, nervis, cerebro, spinali medullæ: calidum vero utile. Aph. sec. v.—par. 18.*

tated stomachs, until after the introduction of tea amongst them." From this, one might suppose that tea caused the teeth to decay, and that dyspepsia was mainly attributable to its use.

The decay of the teeth of these people, since the introduction of tea amongst them, may, however, be much more plausibly accounted for. The susceptibility of these organs to the action of such causes as produce the disease, have been greatly increased by the impaired state of their general constitutional health, occasioned, since this time, by the use of spirituous liquors, and the luxuries common to civilized life, in which they have indulged.

Particular sorts of diet too, such for example, as animal food, are said to exercise an unhealthy influence upon the teeth. And in proof of the assertion, it is stated, that Indian nations, who live principally upon vegetables, scarcely ever have a tooth to decay. But the same may also generally be said of those nations who subsist chiefly on animal diet, and who enjoy an equal degree of constitutional health. Savage and barbarous people are usually possessed of better teeth than those of civilized nations, because their systems are not enervated by luxurious living. So far as diet is capable of affecting the health of the body, it may be considered as an indirect cause of caries; for the health of the child is not always dependent on the health of the parent, and, to the absence of disease in the general system during childhood, the period when the second denture is being formed, is attributable the soundness of the teeth of savage nations.

Animal food may, under some circumstances, be more injurious to the health of the teeth than vegetable, but not to the extent to which many suppose. The fibres of animal matter are rather more apt to be retained between the teeth, than particles of vegetable substances; and by remaining there until they undergo a chemical decomposition, they may vitiate the secretions of the mouth, and thus cause the teeth to decay.

Those parts of the teeth that are covered with a thick smooth enamel, are, in the first instance, never attacked by caries, unless the enamel has previously sustained some injury; and it is not necessary that the injury should be very conspicuous, in order to

admit of a contact between agents that produce this disease and the subjacent bone; they may be of so subtle a nature as to be able to penetrate even a very small fracture.

Dr. L. S. Parmly gives it as his decided opinion that the decay of the teeth is produced by the corrosive action of putrescent foreign matter. The same opinion, too, is maintained by Dr. Eleazar Parmly, and that it is attributable to the presence of chemical agents, is hardly at the present day a controverted point.* The existence of an acid in the mouth, capable of decomposing the teeth, is conclusively proven by Dr. S. K. Mitchell, in a letter addressed by him to T. C. Hope, M. D., of Edinburgh, dated October 10th, 1796, and the fact may be demonstrated by a very simple experiment, which consists in moistening a piece of blue paper, dyed with turnsole, with the fluids of this cavity, obtained from between the teeth, where they have been retained until they have become vitiated. If this be done, the paper will be turned red. If then, these fluids when in a vitiated condition, are possessed of acid qualities, they must necessarily exert a deleterious action upon the teeth, by decomposing and breaking down their calcareous molecules, or in other words, by causing their decay.

This theory of the cause of dental caries, explains the *rationale* of the treatment at present adopted for arresting its progress. By the removal of the decomposed part and the filling up of the cavity with an indestructible material, the presence of those agents, upon the chemical action of which the disease depends, is prevented, and the further progress of the decay arrested.

Among the indirect causes, therefore, of caries, the following may be enumerated: putrescent particles of vegetable or animal matter between the teeth, depositions of tartar, a febrile or irritable state of the body, a mercurial diathesis of the general system, artificial teeth, improperly inserted, or of bad materials; roots of teeth, irregularity in the arrangement of the teeth, too great a pressure of the teeth against each other, and, in short, every

* Previously to the publication of Fox's work on the teeth, this was the prevailing opinion with regard to the cause of dental caries. It is mentioned by Salmon in his *Compendium of Surgery*, as also by Auzebi, and a number of other writers.

thing that is productive of irritation to the alveolar and dental membranes, or gums.

The doctrine that I have here advocated, is one, I confess, that I, for a long time, was unwilling to believe, because it was opposed to all my earlier preconceived notions of the subject; but, long and attentive observation has forced me to acknowledge its truth.

PREVENTION OF CARIES.

It is an old adage, no less true than trite, that "An ounce of prevention is better than a pound of cure," and in the present instance it may be applied with its full force. Were more attention paid to the practical instruction thus conveyed, many of the most distressing diseases of the teeth, might be avoided.

Most of the remarks that might be made on this subject, have been anticipated; consequently, it will only be necessary to observe, that if the teeth are well formed, and well arranged, all that they will require, will be to keep them clean; and if any irregularity occurs, it should be remedied by the means before described.

For cleansing the teeth, the regular and frequent use of a brush and waxed floss-silk, as previously recommended, will, in most cases, be all that is required. The enamel should be kept free from all stains and discolourations, by the employment, three or four times a week, of a dentifrice, or what is still better, an argillaceous tooth-polisher, as advised by Dr. L. S. Parmly. If a powder be used, the following will answer the purpose.

R Orris Root, ʒ ij.
 Prep. Chalk, ʒ ij.
 Prep. Pumice Stone, ʒ i.

These should be reduced to an impalpable powder, and passed through a sieve, previously to being used.

The importance of keeping the teeth clean, cannot be too strongly impressed upon the mind of every individual. Proper

attention to the cleanliness of these organs, contributes more to their health and preservation than is generally supposed. Against caries it is a most powerful prophylactic. "Where the teeth," says Dr. L. S. Parmly, "are kept literally clean, no disease will ever be perceptible. Their structure will equally stand the summer's heat and winter's cold, the changes of climate, the variation of diet, and even the diseases to which the other parts of the body may be subject from constitutional causes."

The configuration of some teeth is such, that it is not possible, by any means, to keep them thoroughly clean, but this should not deter any one from the use of the proper means; for if disease in them be not wholly prevented, it will, at least, contribute very greatly to their preservation.

CHAPTER SECOND.

TREATMENT OF CARIES OF THE TEETH.

ALTHOUGH the physieal condition of the teetth is sometimes such as to render them exceedingly suseeptible of caries, there is no disease to which the body is liable, that can be treated with a more certain prospect of suecess than this. If taken in time, it can always be cured ; and, if in the majority of cases it is not, it is attributable more to a want of skill in the practitioner, than to the incurable nature of the disease. The treatment, to be effeetual, must be thorough, and can only be properly applied by those who are well instructed and have been long and correectly exercised in this department of practice. There is no branch of manual medicine that requires more judgment, or a greater amount of skill than the one within whose province the treatment of the disease, now under consideration, comes.

As a general rule, before any treatment is instituted for the purpose of arresting its progress, the gums and alveolo-dental periosteum should be, in at least, a tolerably healthy condition ; for, if they are inflamed, or ulcerated, or in a highly irritable state at the time, the most skilfully applied remedies may prove unavailing. If therefore, these struetures are diseased, such treatment as may be necessary to their restoration, and which will hereafter be described, should first be had recourse to.

The treatment for arresting the progress of caries, consists in two operations—filing and plugging. The first is for superficial caries on the lateral or approximal surfaces of the teeth, and as preparatory to the other, when the disease is situated here. The second, is for deep seated caries, and the mannor of performing each, will be described under its appropriate head.

OF FILING THE TEETH.

There is no operation in dental surgery, against which a stronger or more universal prejudice prevails, than that of filing the teeth; and when judiciously and skilfully performed, there is none more beneficial, or effectual in arresting the progress of their decay. Thousands of teeth are now every year rescued from the ravages of caries, and preserved through life, by it. But, although it is productive of so much good, it is also, in the hands of ignorant and unskilful operators, productive of incalculable injury.

With regard to the merits of this wrongly judged and much abused operation, my own views are so fully expressed by my brother, Dr. John Harris, in a paper, published in the September No. of Vol. 5th of the American Journal of Dental Science, that I cannot do better than quote his remarks upon the subject.

He says, "Filing the teeth is one of the most important and valuable resources of the dental art; it is one that has stood the test of experience, and is of such acknowledged utility, as to constitute of itself, in the treatment of superficial caries on the lateral surfaces of the teeth, one of the most valuable operations that can be performed on these organs. And, even after caries of the teeth, in the localities just mentioned, has progressed so far as to render its removal, by this means, impracticable or improper, the use of the file, in most cases, is still necessary, in order to the successful employment of other remedial agents. But in either case, a failure to accomplish the object for which it is used, would only be equivalent to doing nothing at all.

The use of the file then, may very justly be considered a *sine qua non*, for the removal of superficial caries from the sides of the teeth which come in contact with each other, as can be attested by thousands of living witnesses, and in preparing the way, in deep-seated caries, for the thorough removal of the disease, and the filling, successfully, of the cavity thus formed.

In a paper written by myself, some eleven or twelve years ago, upon this subject, I contended that filing the teeth was not necessarily productive of caries, and my subsequent experience and

observation have only tended to confirm the correctness of the opinion which I then advanced, and I cherish the belief that this opinion, will not, at this time, conflict with the views of the more enlightened of my professional brethren.

But when reference is had to the physical peculiarities of the teeth, it will at once be perceived, that they present a strange departure from the laws that govern and control all other parts of the body—that these organs, when diseased, can only be restored to health and usefulness by art, unaided by the sanitary powers of nature. Hence it is, that most of the operations upon them, will not, like those in general surgery, admit of mediocrity in their performance.

Empiricism is common in all professions, but in no one is it so much to be deprecated and feared as in the medical, and in no one branch of which, more than in that of dental surgery. However unskilfully and awkwardly an operation in general surgery may be performed, if the patient survives, the ignorance or lack of skill on the part of the surgeon, instead of being exposed to merited censure, is put down to his credit; but any deficiency in the qualifications of the dentist, soon becomes manifest to the patient, who visits upon the author of his disappointed hopes and aggravated condition, a justly deserved indignation. But notwithstanding his shaken confidence in the utility or remedial abilities of the art, he may be induced again and again to seek its aid by calling on other dentists, and, perhaps, without any better success, and, finally, losing all confidence in the resources of the profession, he considers his case hopeless, and gives himself up to despair. His prejudices thus contracted, are made known to, and exert an influence upon all his friends and acquaintances, many of whom, perhaps, for want of confidence thus engendered, and fear of sharing a similar fate, prefer the loss of their teeth, rather than submit to operations, without any prospect of obtaining relief.

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The fact that the crowns of the teeth are covered with enamel, is alone sufficient evidence of its importance and utility in shielding and protecting the bony structure, which it envelopes, from

mechanical and morbid influences, so that it would seem that its removal or loss would necessarily expose the organs to certain destruction. But we have satisfactory evidence, that teeth, after having suffered the loss of large portions of the enamel, have been restored to health and preserved for many years, and often through life.

The rapidity with which caries of the teeth progress, after the exposure of the bone, by the loss of the enamel, depends upon the physical peculiarities of the organs, and upon local and constitutional influences; hence the difficulty, and oftentimes impossibility of obtaining the object for which dental operations are instituted, while such influences are suffered to exist. If special regard is not had to the curative indications, most, if not all of the operations upon the teeth, which have for their object their ultimate preservation, are sure, to a greater or less extent, to augment all of the previously existing local affections, by increasing the irritability of the parts, and by rendering them more susceptible of being acted upon both by local and constitutional causes.

Without indulging in further prefatory remarks, I shall proceed to notice more particularly the subject under consideration. And I would observe, firstly, that an experience obtained from twenty-three years' constant practice, has fully convinced me, not only of the propriety, but of the absolute necessity, in the treatment of caries of the lateral surfaces of the teeth, of employing the file. There is no instrument so well adapted as this for the removal of the disease when situated in these parts of the teeth, and especially when the organs are in close proximity with each other, or for the removal of rough and weakened edges of the enamel in deep-seated caries, and for making sufficient space or room for the removal of the diseased or unsound parts preparatory to plugging.

It may be laid down as a rule, from which exceptions should never be taken, that the file should not be used, while the teeth or their contiguous parts are suffering general or local, acute or chronic, inflammation. Therefore, when this is the case, the treatment of the general and local affections should be precedaneous to the operation of filing. Upon the subjugation of all the acute or chronic diseases of the mouth, the success of the dentist

in the treatment of affections of the teeth, calling for the employment of the file, greatly depends. As much importance, therefore, is to be attached to an enlightened and discriminating judgment, as to tact in the performance of the operation.

In fact, the removal of all local causes of irritation, such as all dead roots of teeth, teeth occasioning alveolar abscesses, or such as exert a morbid influence upon the surrounding parts, and all depositions of salivary calculus or other foreign matter, should always precede all other operations upon these organs.

The length of time necessary for the restoration of the parts contiguous to the teeth to a healthy condition, may vary from a few days, or weeks, to months, depending upon the nature and extent of the disease in them, the general health of the patient, and the constitutional as well as local treatment to which they are subjected. The frequent failures in accomplishing the object for which dental operations are instituted, are, in most instances, the result of the ignorance of the practitioner, or the want of a correct knowledge of the nature, cause and curative indications of the disease he attempts to treat.

But, in assuming the position, that the filing of the teeth, does not, of necessity, cause them to decay, it is by no means to be inferred, that the operation can in all cases, and under all circumstances, be performed with advantage or even impunity. By no means, its effects, like those of most other operations upon the teeth, when the curative indications are disregarded, or not properly carried out, are never passive. The employment of the file at an improper time, and in an improper manner, increases the liability of the teeth to decay, and augments the irritability of all the parts adjacent to them, and consequently their susceptibility of being acted upon by local and constitutional causes.

This view of the subject, taken in connection with the fact, that comparatively few of those engaged in the practice of this branch of surgery, are properly qualified for it, satisfactorily accounts for the pernicious effects that so frequently result from the use of the instrument in question, and for the wide-spread and deep-rooted prejudice that has obtained against its employment.

The principal, and I believe only, objection urged against filing the teeth, is based upon the erroneous belief, that the loss of any part of the enamel of these organs, must necessarily result in their destruction. But if this be true, why is it, as I have on another occasion asked, that the negroes of Abyssinia have such sound teeth as they are represented to have, since it has long been a custom with them, to file all their front teeth to points, so as to make them resemble the teeth of a saw or those of carnivorous animals. Of course, large portions of the enamel and considerable of the bony structure, must be removed in the operation, and yet we are credibly informed that their teeth seldom decay. The same may be said of the Brahmins of India, who, from remote ages, have been in the habit of using the file, principally, I believe, for separating their teeth, and they too, are noted for having fine teeth. I might refer to the people of other countries, with whom the same practice has long had an existence, but it is not necessary to go abroad for proof, when we have such an abundance of it at home, to establish the propriety and absolute necessity for the practice I am now advocating.

With the people just referred to, it is evident that they file principally for the purpose of ornamenting their teeth, but with us, only as a remedial agent in the treatment of their diseases. The reason why their teeth are not so subject to disease as are those of the inhabitants of luxurious and civilized countries, is attributable to the difference in their habits of life, modes of living, and the absence of the causes productive of the various diseases peculiar to civilization and refinement.

But notwithstanding the utility and value of the operation, the filing of the teeth may be regarded as a predisposing cause of caries. But if this be true, it may be asked, why file at all? I answer, in this country, owing to the prevalence of the immediate or direct cause of caries, the operation is only performed as remedial, for the purpose of removing *actual* disease, or as preparatory to plugging. It does not, of necessity follow, that caries of the teeth, after having been judiciously removed or treated, although the organs be predisposed to the disease, should ever again occur. The general system often escapes the development

of disease to which it is predisposed through life, so also do the teeth. If the operation be properly performed, and the filed surfaces kept thoroughly clean, a recurrence of the disease, notwithstanding the increased predisposition thus induced, will never again take place. The immediate cause of dental caries being the contact of corrosive agents with the teeth, the necessity for this precaution is obvious. The bony structure of these organs is more easily acted upon by such causes, than the enamel, and for this reason, when it becomes necessary to expose it, with a file, for the removal of disease, it should be done in such a way as to admit of its being kept thoroughly and constantly clean, so that if it afterwards becomes carious, it will be owing altogether to the inattention of the patient. In view of this, whenever it becomes necessary to file the teeth, whether for the complete removal of caries, or as only preparatory to plugging, we should always impress upon the patient the importance of attending to this matter, of cleansing the surfaces thus operated upon, at least three or four times every day. The future preservation of the organs, and especially such as are of a soft or chalky texture, for they are then by far more easily acted upon by decomposing agents than when hard, will depend upon the constant and regular observance of this precaution.

The cases requiring the use of the file vary so much, that it would be difficult to lay down precise directions with regard to the extent to which the operation should always be carried. This must be determined by the judgment of the operator.

The object for which the operation is performed, may be defeated either by filing too much or too little. Either extreme should be avoided, but I am of the opinion, that by far the greater number of unsuccessful results are attributable, rather, to the too moderate than to the too great use of this instrument, and especially where the circumstances of the case have nothing to do in determining the result.

But it is not my object to describe the manner in which teeth should be filed, but merely to offer a few general remarks on the advantages that result from it when the operation is judiciously performed, and to show, that it is from the abuses of the use of

the file, in the hands of ignorant and inexperienced practitioners, that its merits have been so frequently erroneously estimated.

It will be perceived from the foregoing remarks, that its utility depends upon carrying out all the curative indications, that it should never be resorted to except in the absence of disease in the parts with which these organs are immediately connected. Therefore, to estimate the merits of the operation, correctly, we should know all the circumstances under which it has been performed, the competency of the operator, and whether he was permitted the free exercise of his judgment.

The dentist is often called upon to render his services, where, from the timidity or ignorance of his patient, he is, if he consents to operate at all, so restricted in the application of his remedies, that but little, if anything more than temporary relief can be afforded. And cases may occasionally occur, in which, from unforeseen circumstances, even after the most skilful management, the dentist may be disappointed in his expectations, and fail in the attainment of the object for which his services were solicited."

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With regard to the utility of the operation, Dr. E. Parmly thus expresses himself:

"On the subject of cutting away and filing off external portions of teeth affected with gangrene," [caries] "I am aware that a mistaken prejudice prevails in society, resulting perhaps from the mal-practice of ignorance and empiricism. And yet there is no part of dental practice promising more certain and beneficial results when properly executed. If the operation be effectually performed, the progress of decay is arrested; and if the mutilation of the tooth be as small as the nature of the case admits, an important object is unquestionably attained. The successful performance of this operation, implies one invariable and indispensable condition, viz: that the portion of bone from which the enamel has been removed, shall be perfectly smooth and polished, leaving to the patient the responsibility of having it kept so."

To ensure the success of the operation, it is sometimes neces-

sary to file away a considerable portion of the tooth, but in doing this, the operator should be careful not to destroy the symmetry of its labial surface. The aperture anteriorly should only be wide enough to admit of a free oblique or diagonal motion of a safe-sided file of about one-half or two-thirds of a line in thickness. In this way one-third or more of a tooth may be removed without materially altering its external appearance. But a tooth should not be filed entirely to the gum; a shoulder or projection should be left so as to prevent the approximation of it and the adjoining organ.

When the decay occupies a large portion of the approximal surface, and has penetrated into the tooth to a considerable depth, and destroyed the enamel anteriorly, so as to cause it to present a ragged and uneven edge, it will be necessary to form a wider exterior aperture than correct taste would dictate. When the approximal surfaces of two front teeth are affected with caries, about an equal portion, if circumstances will permit, should be filed from each tooth.

It is hardly necessary to give any directions with regard to the manner of holding the file. In filing the front teeth and those on the right side of the jaws, the operator should stand at the right and a little behind the patient, so as to steady his head as it rests against the head-piece or top of the back of his operating chair, with his left arm, while with the fingers of the hand of the same, the lips should be raised and the teeth properly exposed for the operation. In filing the teeth on the left side of the mouth, it will be necessary for the operator to stand upon the other side of his patient. The file, firmly grasped between the thumb and middle finger of the right hand, with the end of the fore-finger resting upon the edge of its distal extremity, should be moved backwards and forwards in a direct line, as any deviation from this, would instantly snap the instrument. The first opening between the teeth, when the approximal edges of two are carious, should be made with a flat file, of about half a line in thickness, cut on both sides and both edges; this done, a file cut only on one side and both edges, should be employed for the completion of the operation. If but one tooth is decayed, the operation may be com-

menced and completed with a safe-sided file. The file, during the operation, should be frequently dipped in water, so as to prevent it from becoming heated, or choaked between the teeth.

After a sufficient portion of the tooth has been filed away, the surface should be made as smooth as possible with a very fine or half worn file and burnisher. The edges and sharp corners should be rounded and made smooth, and when the operation is completed, the patient should be directed to keep them perfectly clean, for if the mucus secretions of the mouth, or extraneous matter is permitted to adhere to them, a recurrence of the disease will take place.

The sensation produced by filing the teeth, is, to most persons, disagreeable, and, to some, positively painful; but, when once the operation has been commenced, it should never be left uncompleted. If the patient becomes alarmed, his fears should be quieted by a true statement of the case, and his consent to proceed, won, by a mild and persuasive deportment.

It is often exceedingly difficult to procure suitable files for the operation. Stub's Manufactory, is, I believe, the only one in the world that has succeeded in making such as are unobjectionable.

In separating the bicuspidæ, an aperture should be made somewhat in the form of the letter V; it should not, however, form an acute angle at the gum; and for its formation, a file, shaped like the pinion-file of a clock, or one that is oval on one side and flat on the other, will be found most suitable. An aperture, shaped like this, will prevent the approximation of the sides of the teeth, and, if plugging be necessary, it will enable the operator to do it in the most perfect manner.

When the separation of the molar teeth becomes necessary, the same shaped aperture should be formed. But, as these teeth are situated so far back in the mouth, it cannot often be done with a straight file, and to obviate the difficulty, an instrument, with which every dentist is acquainted, denominated a file carrier, is usually employed. In consequence of the difficulty of procuring instruments of this kind, exactly suited to holding files of the right shape, the author, a few years ago, constructed some file patterns for this purpose, and through Messrs. Canfield & Brothers,

of Baltimore, sent them to Stub's Manufactory, in England, and had files made, that he found to answer his fullest expectations. The file is shaped something like the pinion file of a clock; it is an inch and a half long, and has a handle of about six inches in length, bent in such a manner that the instrument may be used on the molar teeth without interfering with the corners of the mouth. These files are in pairs—one for the right and one for the left side of the mouth, and they, together with almost every other description used by dentists, are kept for sale by the above named gentlemen.

OF PLUGGING OR FILLING TEETH.

This is the most difficult operation the dental practitioner is ever called upon to perform,—it oftentimes baffles the skill of operators who have been in practice from ten to twenty years. It is also, when well performed, the most certain and only remedy that can be applied for the cure of deep-seated caries. But to be effective, it must be executed in the most thorough and perfect manner. The preservation of a tooth, when well filled, and with a suitable material, if it be afterwards kept constantly clean, may be regarded as certain. At any rate, it will never again be attacked in the same place by caries.

On this highly important operation, Dr. E. Parry thus remarks:—"If preservation is as good as a cure, this is as good as both, for the operation of stopping, when thoroughly performed, is both preservation and cure. And yet, it must never be forgotten, that this assertion is true only in those instances in which the operation is well and properly done; and perhaps it is imperfectly and improperly performed more frequently than any other operation on the teeth.

There are reasons for this fact, into which every ambitious and honourable practitioner will carefully inquire.

Although the books are explicit on this point, I deem it sufficiently important to deserve a few additional remarks, and yet I am perfectly aware that my time requires me to be extremely general in my observations. Let me say then, that the following considerations are essential, and therefore indispensable to success in this department of practice.

First—The instruments used must be of the proper construction and variety.

Second—The metal employed must be properly prepared as well as properly introduced.

Thirdly—The cavity which receives the metal, must be so fitted as to retain it in such a manner as to exclude not only solids, but all fluids, and even the atmosphere itself.

Fourthly—The surface of the metal must be left in such condition as to place it beyond the reach of injury from food and other mechanical agents with which it must of necessity come in contact.

Fifthly—The tooth thus stopped, should be free from pain, and every known cause of internal inflammation.”

It is necessary, however, that the operation should be performed before the caries has reached the pulp cavity, for after this, the preservation of the tooth, especially if it be a molaris, may be regarded, in at least four cases out of five, as hopeless, unless the material employed for filling the cavity can be so introduced as not to press upon the nerve. When the lining membrane and pulp of a tooth have been destroyed, whether by the process of inflammation and suppuration, or by arsenic, or by any other means, except it be an incisor or cuspidatus, the chances of its permanent preservation are still less, for in this case, it becomes a source of irritation to the surrounding parts, causes a morbid secretion at the extremity of its root or roots, as it may have one or more, which is discharged through them, as long as the cavity remains open; but if this is filled, the matter is prevented from escaping through it, and the result is, that it accumulates and ultimately makes for itself a passage and is discharged either through the alveolus and gum, or the floor of the maxillary sinus. It however, more frequently takes the former than the latter direction.

For the purpose of preventing the effects that result from the accumulation of matter in the tubercle at the extremity of the root, Dr. L. S. Parmly, in a conversation with the author, some years ago, stated, that he was in the habit, when he plugged teeth thus affected, of introducing the filling round a small probe or wire, with one end resting upon the bottom of the cavity, and which,

after the operation was completed, he withdrew. By this means, an opening is left through the plug for the escape of the matter. But, while the decay of the walls of the tooth is thus prevented, and the organ, for a time, rendered serviceable, the ravages of the disease is going on interiorly, and must of necessity, sooner or later, effect its destruction.

Drs. Baker, of New York, and Maynard, of Washington city, propose a plan of treatment, by which they are of the opinion, the disease at the extremity of the root, may, in the majority of cases, be radically cured. It consists in freeing the canal through the root of all impurities, and filling it to the very apex, as well as the cavity in the crown, with gold. This practice is based upon the supposition, I believe, that if the accumulation of matter in the root can be prevented, its secretion will cease.

The author has adopted this practice in a great number of cases, and the result of his experience does not warrant him in recommending it to others, except the disease at the root of the tooth can be previously subdued. In this, he has, in a few instances, been successful by injecting the canal through the root, once a day, for one or two weeks, with a weak solution of the nitrate of silver. But neither with this, nor any other treatment has he been able to effect a radical cure, in more than one case out of five. The operation will often appear to be successful for a few weeks or months, and sometimes for a year or two, but sooner or later, in a very large majority of cases, it will result in the discharge of matter through the alveolus and gum or into the maxillary sinus.

A front tooth, after the destruction of its pulp, is not so liable to give rise to alveolar abscess as a molaris, and consequently may oftentimes be preserved for years, by being properly plugged. But where there is a discharge of fœtid matter from it, the operation of plugging is not advisable.

A tooth may sometimes be plugged when the pulp is exposed; but great care should be taken to prevent the gold from coming in contact with it, else severe pain will be produced, and the removal of the filling rendered indispensable.

Dr. Koecker recommends, in cases of this sort, covering the exposed pulp with a piece of thin leaf lead, on the ground that this metal is supposed to be less irritating to the animal fibre than any other. I have never tested the merit of this practice, but am disposed to believe that it will not answer, for the reason that the extreme sensibility of the pulp is such, that the contact of any hard substance with it would be productive of great pain.

Dr. Fitch says he has often succeeded, by covering the exposed nerve with a plate of gold. This is by far preferable to the plan proposed by Dr. Koecker, for the gold plate may be so fitted to the cavity that its edges will rest upon the circumjacent bone, and thus be effectually made to shield the exposed pulp. After this has been properly placed, the filling may be introduced without danger of coming in contact with the nerve.

But, if there be inflammation in the lining membrane, Dr. F. recommends that this should be reduced, previously to the application of the plate; and for this purpose, he advises the use of the Aleppo galls. He directs that a small portion of the fresh nut be placed in the cavity of the tooth, and covered with bees-wax, in order to protect it from the action of the air, and the whole to be renewed every ten or fifteen days. I have adopted this treatment in a number of cases, but have seldom succeeded with it. I cannot, therefore, speak of it in as high praise as does its author.

It is an exceedingly difficult matter to reduce inflammation of the lining membrane of a tooth. Indeed, it can rarely be done; and although I have sometimes succeeded, I am fully of the opinion, that in all such cases, except the tooth be an incisor or cuspidatus, the affected organ should at once be extracted.

A tooth is oftentimes exceedingly sensitive, when the nerve is not exposed; but this need never deter the dentist from removing the decayed part and plugging the cavity, as the only inconvenience which it will occasion the patient, will be a little suffering during the operation, and slight momentary pain for a few days, whenever he takes any thing hot or cold into his mouth. But, if the sensibility is so great as to render it impossible for the

patient to endure the operation, the twentieth or twenty-fifth part of a grain of arsenic, with an equal quantity of the sulphate of morphia, should be applied to the diseased part, and the cavity afterwards sealed up with white wax, or gum mastic, to prevent it from getting into the mouth and being swallowed, and the saliva from getting to it. At the expiration of from three to five hours, it should be removed, and the cavity properly prepared and filled. There is great danger, however, when this is applied to the front teeth of very young persons, if it be permitted to remain too long, of its inducing inflammation and sometimes the death of the lining membrane, and causing the tooth to assume a dark, muddy, or purple appearance. Therefore, when applied only for the purpose of destroying the sensibility of the bone of the tooth, it should not be permitted to remain any longer than is necessary for the accomplishment of this object.

The employment of arsenic for the destruction of an exposed nerve, was first recommended by Dr. Spooner, of Montreal, and made public by his brother, Dr. S. Spooner, of New York, in a very excellent popular treatise on the teeth. For some time, it promised to be a most valuable remedy, and was soon used by nearly every practitioner in the country; but, the high hopes which it inspired were not destined to be of long duration; for it was found, that although the nerve of a tooth could, in a few hours, always be destroyed by it, if it was afterwards plugged, it was just as liable to give rise to alveolar abscess, as one which had been filled, after the destruction of its nerve by inflammation and suppuration. In consequence of this, its employment has, to a great extent, been abandoned.

The plugging of teeth, therefore, is advisable only under certain circumstances, and when the operation is performed without a due regard to these, it may be productive of great injury.

OF THE MATERIALS EMPLOYED FOR FILLING TEETH.

Among the articles that have been employed for filling teeth, are, tin, lead, gum mastic, silver, an alloy of bismuth, tin and lead, an amalgam of mercury and silver, platina, and gold.

Tin, when properly prepared, by being beat into thin leaves, is less objectionable than most of the articles just enumerated. When well inserted into the cavity of a tooth, properly prepared, it will sometimes effectually preserve the organ. But if the fluids of the mouth are very much vitiated, or should they at any time afterwards become so, it soon oxydizes and turns black, and then, instead of preventing, it rather promotes a recurrence of the disease. This, with me, has constituted an insuperable objection to its use. As an excuse for its employment, however, many operators say, that in consequence of its greater malleability than gold, it can oftentimes be employed for filling a badly-shaped and large cavity when the last named article cannot be used. I do not, however, regard this as a valid objection. Any tooth that can be filled with tin, can be equally well filled with gold. Others again employ it, because many of their patients are not able to pay for a more costly material. Now, if a tooth is worth filling at all, it is worth filling in a proper manner, and with a suitable material, and it would be by far more creditable to the operator to divide the expense with his poor patient, than to use an article that may never benefit him.

Lead is even more objectionable than tin, as it is more easily decomposed by the secretions of the mouth, and by being introduced into the stomach, may be productive of serious injury to the general health of the patient. But happily, this article is now seldom used, except by the most ignorant and lowest class of empirics.

Gum mastic, although at one time much used, is now seldom employed, except as a temporary filling when the pulp of the tooth is exposed, and when used even for this purpose it requires to be often renewed, as it is soon dissolved by the saliva.

Silver. This article is more easily oxydized by the septic (nitrous) acid of the mouth than tin, and therefore, in consequence of its greater destructibility, is more objectionable. Besides, it is much harder and more difficult to pack. It is now little used.

The alloy of bismuth, tin, and lead, or D'Arcet's metal, as it is sometimes called, is used in a state of fusion. It was never, however, very popular, as the temperature required to fuse it being that of boiling water, excited inflammation in the tooth and its membranes. It was also found, that upon cooling it shrunk, and admitted the fluids of the mouth into the cavity of the tooth around it. Its use was therefore, soon discontinued.

The amalgam of mercury and silver, but better known by the name of *mineral cement*, or *Lithodeon*, is decidedly the most pernicious material that has ever been employed for filling teeth. It not only readily oxydizes in the mouth, turning the teeth black, and hastening rather than preventing their destruction, but it also, when used in any considerable quantity, exerts a deleterious effect upon the alveolo-dental membranes, gums, and all the parts of the mouth. The author has a case at this time under treatment, of a young lady, about sixteen years of age, who is suffering from chronic inflammation of the alveolo-dental periosteum of nearly half her teeth, gums and mucus membrane of her mouth, caused by three large fillings of Lithodeon, in her molar teeth. Two of the teeth thus filled he has already had to extract, and he is fearful that the removal of the third will become necessary. In the first edition of this part of his work, he expressed his disapprobation of the employment of this article, and since that time, he has had abundant opportunity of observing its effects, and has been fully confirmed in the unfavourable opinion which he then advanced with regard to it. Several decided cases of salivation occasioned by the use of this amalgam, have fallen under his own observation.

Some have endeavoured to obviate the objection to this amalgam by using silver perfectly purified, but it matters not how pure the silver may be, the material will be equally deleterious in its effects. Nor would pure gold and quicksilver be any better. It is the mercury that does the injury, and it matters not therefore, how pure or what the other metal may be that is employed with it for the formation of the amalgam.

This article has been extensively used and highly puffed, by a certain class of practitioners, during the last five or six years, both

in the United States and England, but it has had its day, and I am happy to believe, that it is not at present employed by any scientific or respectable practitioner.

Platina, from its capability of resisting the action of the acids of the mouth, would if it were sufficiently malleable, be unobjectionable, but when in a pure state, it is too hard to admit of being properly packed into the cavity of a tooth. A perfect filling, therefore, cannot, without great difficulty, be made with it. For this reason it is not much used.

Gold. To this metal, when properly prepared, there is no objection, and it is the only one that should ever be employed for filling teeth. Nothing better is wanted. A tooth may be so filled with it as effectually to secure its preservation. It, however, should be perfectly pure, beat into thin leaves and well annealed before it is used. When prepared in this manner, it can be pressed into all the inequalities of the cavity, and made so firm and solid as to render it impermeable to the fluids of the mouth.

OF THE FORMATION OF THE CAVITY.

This is an important part of the operation, and though generally the easiest, is nevertheless, often attended with some difficulty. The removal of the diseased part of the tooth is not always, all that it is necessary to do, preparatory to the introduction of the gold. The cavity must be so shaped, as when properly filled, to prevent the liability of the filling coming out. The part of the tooth too, surrounding the orifice should present no rough or brittle edges or points. The bottom of the cavity should be as nearly of the size of the orifice as it is possible to make it, and it would be better to have it even a little larger than smaller. But the difference between the size of the one and the other should never be very great; for if the interior of the cavity is much larger than the orifice, it will be difficult to make the plug sufficiently firm and solid to render it impermeable to the fluids of the mouth; and if on the other hand, the orifice is larger than the bottom of the cavity, there will be danger of not being able

to obtain sufficient stability for the filling to prevent it from ultimately loosening and falling out. It often happens, however, that the situation and extent of the decay is such, as to render it impossible to make the cavity as large at the bottom as at the orifice, and when this is the case, several circular grooves should be cut on its inner walls for the purpose of obtaining as much security for the filling as possible. By properly attending to this precaution, a plug may often be so inserted as to prevent it from ever coming out.

Ordinarily, it is much easier to form a cavity in the grinding surface of a molaris or bicuspid, than in any other tooth or part of a tooth, though it sometimes happens, that even here it is attended with difficulty, and especially, when the decay, commencing in the centre, follows the several depressions which run out from it. In cases of this sort, the edges bordering on and covering the diseased part, and which are often thick and very hard, should be cut away so as to completely expose it and form an opening as large as the cavity will be in the interior after it has been removed. Caries of the approximal surface of a tooth has first to be exposed by filing a space between the affected and adjoining organ, before it can be approached by the dentist, and even then its removal and the proper formation of the cavity is oftentimes a nice and exceedingly difficult operation. The aperture between the teeth should always be made sufficiently wide to enable the dentist to operate with ease; otherwise it will be impossible to remove the caries and plug the tooth in a proper manner. In young subjects, the teeth may sometimes be separated sufficiently to admit of the operation of plugging, with wedges of soft wood or gum elastic. This is recommended, and has been practiced with success by Dr. E. Parmly. It is only admissable, however, in the fewest number of cases. If it be attempted after the twentieth or twenty-fifth year of age, there will be danger of inducing an inflammation in the alveolo-dental membranes and gums that will ever after render them exceedingly susceptible to morbid impressions. Much judgment, therefore, is necessary in determining the propriety or impropriety of its adoption.

For forming the cavity, a variety of instruments is required, which should be made from the best of steel, and so tempered as

to prevent them from either breaking or bending. Their points should be so shaped that they may be conveniently applied to any part of the tooth, and made to act readily upon the portion which it may be necessary to remove.

These instruments are called excavators, and may either be formed with or fitted to separate handles, or made to fit into one common handle, provided with a socket for the purpose. Those having separate handles are rather more convenient than the others, but it would be well for every operator to be provided with a number of both kinds.

The flat, and rose or cherry-headed drills, are also very useful in forming the cavity. They are sometimes used in a common socket handle, and at other times in a drill stock, turned with a string and bow. The latter method of using them is objected to by some practitioners, on the supposed ground, that it produces more irritation in the bone of the tooth than the former. But the validity of this objection is not established by experience. I have used the drill in this way, more or less, for upwards of fifteen years, and have never known any evil consequences to result from it.

For opening a cavity into the grinding surface of a tooth, where it is nearly hid by projecting portions of the enamel, the rose-headed drill is invaluable, and it can also very often be advantageously applied to the side of a tooth. There are many cases too, where the flat pointed drill can be beneficially employed, as for example, when it becomes necessary, as it often does, to extend the cavity further into the tooth than the disease has penetrated. But the formation of the cavity can seldom be properly completed with either the rose-headed or flat pointed drill. After it has been opened and the orifice made sufficiently large, it should be finished with excavators properly adapted to the purpose, and with these, in fact, in the majority of cases, it should be wholly formed.

When the drill is used, it should be frequently dipped in water, to prevent it from becoming heated. This is a precaution that should never be neglected.

As the proper formation of the cavity greatly depends on having suitable instruments, every operator should be provided with

a large supply of drills and excavators, both, varying in size, and the latter in shape, so that he may never be at a loss for such as may be required by the peculiarity of any case that may present itself. He should also be provided with the means and be able to make them himself whenever occasion may require. It is important too, that they should be sharp, and as they are constantly getting dull, he should always have a good oil-stone upon his table, on which he may at any moment sharpen them.

After every particle of decomposed bone has been removed, the cavity should be thoroughly cleansed before the plug is inserted. This may be done by first injecting tepid water into it with a properly constructed syringe, and afterwards wiping it dry with a small lock of raw cotton fixed upon the point of a small probe or excavator; or, the cavity may, in the first place, be wiped with a little raw cotton, moistened with luke-warm water, and afterwards with dry cotton. The latter method is the most convenient, and is equally as good as the former. The cavity should always be dry when the material with which it is to be filled is introduced.

OF THE INSTRUMENTS FOR AND MANNER OF INTRODUCING THE GOLD.

For introducing and packing the gold, a number of instruments are required, which should be sufficiently strong to resist any amount of pressure the operator may be capable of putting upon them in the operation. They should have round or octangular handles, large enough to prevent the liability of their being broken, and to enable him to grasp them firmly in his hand. Their points should vary in size, though none should be very large. Several should be straight, but for the most part, they require to be curved;—some very slightly, others so as to form with the shaft of the instrument an angle of ninety degrees. Most of them should have a slim wedge shape. Some however, both of the straight and curved instruments, should have blunt points, and a few should have highly polished oval points, for finishing fillings, in the grinding and other exposed surfaces of the teeth. Most dentists employ for putting in and packing the gold, blunt-pointed

pluggers; but, it is impossible with such instruments to make it as firm and solid as it should be for the perfect preservation of the tooth, and especially if the cavity is large. From one-fourth to one-half more gold can be put into a tolerably large sized cavity, with a wedge-pointed instrument, than with a blunt-pointed one.

The sides of the wedge-pointed pluggers should be left rough, for the purpose of preventing them from cutting the gold. It is also better to have the ends of the blunt-pointed instruments a little rough upon their surface.

This general description will serve to convey a tolerably correct idea of the number and sort of instruments required for the operation; but, no two dentists have their plugging instruments precisely alike; each has them constructed in such a way as he thinks will enable him to apply them most easily and efficiently to the various parts of a tooth which may require plugging.

The operator, being provided with the necessary instruments, should cut his gold with a pair of scissors, into strips of from half an inch to an inch wide. Each of these should be loosely rolled or folded together lengthways, and after the cavity has been properly cleansed and dried, the end of one should be introduced to the bottom of the cavity, with a straight or curved wedge-pointed plugger; the roll on the outside should be folded on the part first inserted. The folding should be commenced on one side of the cavity, and each fold should touch the bottom and extend nearly the eighth of an inch on the outside of the orifice, and thus fold after fold should be made, until the cavity is pretty well filled. Having proceeded thus far with the operation, a wedge-pointed plugger should be forced down through the centre of the filling, and the gold firmly pressed out with it against the walls of the cavity. The opening made through the centre of the filling should then be filled in the manner as first described, and this time it should be packed in as tightly as possible. This done, the operator should endeavour to force in a smaller wedge-pointed instrument than was employed in the first part of the operation, at the side or some other part of the cavity; and thus he should proceed, until he has tried every part of the plug; filling, as he

proceeds, every opening which he shall have made, and exerting, in the packing of the gold, all the pressure which he can put on, without endangering the tooth. If one roll or fold of gold be not enough, he should take another and another, until every part of the cavity is filled.

The advantage to be derived from introducing the gold in this manner into the cavity is obvious. By extending the folds from the orifice to the bottom of the cavity, the liability of the gold to crumble and come out, is effectually prevented, and by putting it in with a wedge-pointed instrument, it may be pressed out into all the depressions of the walls of the cavity, and rendered altogether more solid than it could otherwise be made.

When the nerve is exposed, the interior extremities of the folds should not touch the bottom of the cavity, and, after the cavity has been loosely filled in the manner described, the wedge-pointed plugger, instead of being forced through the centre of the filling, should be introduced at one side. In this way a cavity in the side of a tooth may often be so filled as to secure its preservation for a number of years, if not through life. But it requires a dexterous and experienced practitioner to do it, and on the grinding surface of a tooth the operation can seldom be made to succeed, nor should it ever be attempted when the lining membrane is inflamed, or while there is pain in the organ.

After the cavity has been thoroughly filled, every portion of the projecting part of the plug should be firmly pressed in the direction towards the bottom of the cavity with either a straight or blunt-pointed instrument, as may be most convenient; or if the plug be in the side of a tooth next another, it may be compressed with the angle of the point of the plugger, making the adjoining organ a kind of fulcrum for the instrument. After the projecting part of the filling has been thus pressed, as long as it can, in the least, be made to yield, it should be scraped or cut, if in the grinding face, and filed, if in the side, down to the tooth, and afterwards polished or burnished until its surface shall become as smooth as a mirror. Every part of the surface of the filling should be flush with the parts of the tooth surrounding it, that not the slightest lodgment may be afforded to particles of extraneous matter, or clammy mucus. This should never be lost

sight of, for however good the filling may be in other respects, if every part of its surface be not flush with the tooth, the object for which it is introduced, may, by the retention here of corrosive agents, ultimately be defeated.

The time required to fill a tooth well, by an expert operator, may be said to vary from thirty minutes to two hours and a half, according as the cavity is large or small, or favourably or unfavourably situated. Much less time and skill are required to fill a cavity in the grinding surface of a tooth than in the side, and the operation in either place to be beneficial to the patient, must be well performed, and the dentist who does not feel the importance of executing it in a proper manner, should never be entrusted with the management of the diseases of these important organs.

In every part of the operation, the dentist should so guard his instruments as to prevent them from slipping, and he will be better able to do this by standing a little to the right and behind his patient than in any other position. In plugging the lower teeth he should stand from six inches to a foot higher than while plugging the upper, and to enable him to do this, he should be provided with a stool which he can use at pleasure. When it can be done, he should grasp the tooth he is filling with the thumb and forefinger of his left hand, so as not only to steady it, but also to catch the point of the instrument in case it should slip; but if he is always careful to press in the direction towards the cavity, this need never happen, and against it he should always be guarded. When he cannot shield the mouth with the thumb and finger of his left hand as described, he should let the thumb or one of the fingers of his right hand rest either upon the tooth he is operating on, or upon some other.

CHAPTER THIRD.

TOOTH-ACHE—(*Odontalgia*.)

Few persons reach the age of eighteen without being attacked with the tooth-ache, either in some of its milder or more aggravated forms. This pain is often so excruciating, that none but those who have experienced it, can form an adequate idea of its torture: and yet many are content to suffer the agony it inflicts, rather than have the offending organ removed.

Its attacks are very variable in their form and duration. Sometimes it commences with a slight pain, which gradually increases in severity, until it becomes almost insupportable. At other times, the first monition of its presence, is a sharp pain, that shoots, with the rapidity of thought, from the tooth in which it originates, to the jaws, face and temples. In some cases, the pain is deep-seated, accompanied by throbbing sensations; while in others, it is only slight and tantalizing. Sometimes it continues for a long while, without any intermission. At other times, it recurs at uncertain intervals, and continues, from fifteen or twenty minutes, to one or two hours.

It is generally, but not always, confined to the tooth in which it originates; for sometimes it passes from that to another, until the whole row is affected: and it not unfrequently happens, that the cause is seated in one tooth, while the pain is felt in another, even situated, it may be, on the opposite side of the mouth.

CAUSES.

This most distressing affection is the result of inflammation, either in the lining, investing, or alveolar membrane, or is occasioned by a transfer of nervous irritation.

The lining membrane is more apt to inflame, than the investing or alveolar; because it is more liable, from the decay of the teeth, to become exposed to the action of aerid humors, and to exciting and irritating agents. Moreover, when it does become inflamed, the inflammation occasions a much greater amount of pain, because, surrounded as it is, by an unyielding bony paries, there cannot be any considerable distention of its vessels, consequently the pressure upon its ramifying nerves, necessarily causes very great pain.

Inflammation here, generally soon extends to the alveolo-dental membranes, causing them to become thickened, and to raise the tooth slightly from its socket, and to strike its antagonist, before the other teeth meet. The inconvenience occasioned by this, is sometimes so great, that the proper comminution of food is prevented, and when prompt measures are not taken for the relief of the inflammation, it assumes a chronic form, and ultimately causes the destruction of the socket, and the loss of the tooth.

Inflammation of the lining membrane is generally occasioned by the direct contact of aerid humors, and of irritating and exciting agents, such as decomposed portions of decayed teeth, small particles of food, and vitiated saliva, &c. It can never, however, be thus produced, except when the pulp, from the decay of the tooth, or some other cause, has become exposed. It is, however, sometimes brought on by hot and cold beverages, cold currents of air passing through the mouth, mechanical violence, improperly performed dental operations, and from inflammation of the membranes of the roots.

Inflammation of the membranes last mentioned, may result from colds or tumefaction of the gums, occasioned by depositions of tartar, or the administration of mercurial medicines, blows, and jarring of the teeth, produced by an unskilful use of the file.

But cases of tooth-ache are often met with, that are the result of none of the causes that have as yet been enumerated. The affection is often induced by morbid sympathy between the teeth and some other part of the body. Persons of a nervous temperament, and pregnant females, are particularly subject to this sort of tooth-ache; and sometimes it is a symptom of a disordered state of the stomach. When it is the result of morbid sympathy, its attacks

are usually periodical, seldom lasting more than two or three hours at a time, and recurring sometimes at stated, but more generally, at uncertain intervals. Sound teeth are almost as much subject to it, as those that are decayed. It is often difficult to distinguish which of the teeth is most affected by it; for it often seems, at one minute, to be seated in one tooth, and at the next, in another; and thus passes round the whole jaw. In some instances, it is acute and lancinating; in others, dull and heavy.

Some teeth, from a peculiar idiosyncrasy, are much more liable to ache, than others. Whole sets sometimes decay, and crumble to pieces, without pain, while others, apparently perfectly sound, are very painful.

In treating of tooth-ache, Dr. Good observes: "This is often an idiopathic affection, dependent upon a peculiar irritability, from a cause we cannot easily trace, of the nerves subservient to the aching tooth, or the tunics, by which it is covered, or the periosteum, or the fine membrane that lines the interior of the alveoli. But it is more frequently a disease of sympathy, produced by pregnancy, or chronic rheumatism, or acrimony in the stomach, in persons of an irritable habit."

"It is still less to be wondered at, that the nerves of the teeth should often associate in the maddening pain of *neuralgia faciei*, or *tie douloureux*, as the French writers have quaintly denominated it, for here the connection is both direct and immediate. In consequence of this, the patient, in most instances, regards the teeth themselves as the salient points of pain, (*and they unquestionably may be so in some cases,*) and rests his only hope of relief upon extraction; and when he has applied to the operator, he is at a loss to fix upon any one point in particular. Mr. Fox gives a striking example of this, in a person from whom he extracted a stump, which afforded little or no relief; in consequence of which his patient applied to him only two days afterwards and requested the removal of several adjoining teeth, which were perfectly sound. This he objected to, and suspecting the real nature of the disease, he immediately took him to Mr. (now Sir) Astley Cooper, who, by dividing the affected nerve, produced a radical cure in a few days."

The author is acquainted with a gentleman similarly affected,

as the one mentioned by Mr. F. He has had all his teeth on the right side of both jaws, extracted, without obtaining any relief.

TREATMENT.

It has been regarded as an axiom in medicine, since the days of Hippocrates, that the first step to be taken in the treatment of disease, is the removal of all the primary causes; and to no disorder will this maxim be found more applicable, than to the one now under consideration. The treatment of tooth-ache, therefore, should vary according to the causes that have produced it; and, if the lining membrane of the aching tooth is not exposed, a radical cure may often be affected.

But when this membrane has become exposed, although by the application of leeches to the gums, and soothing and astringent preparations to the cavity of the tooth, the inflammation may sometimes be subdued, and temporary relief afforded; yet the nerve, from its unprotected condition, will ever afterwards be liable to injury and renewed attacks of inflammation. Hence, in such cases, the tooth, if not situated in the anterior part of the mouth, should be extracted. But, as the dentist is not always permitted to perform this operation, a resort to other means often becomes necessary.

In such cases, two or three leeches should be applied to the gum of the affected tooth, and either of the following applied to the exposed nerve:

℞ Sul. æther, ℥ i.
Kreosote, ℥ ss.
Ext. nut galls, ℥ i.
G. camph. ℥ ss. *Misce.*

℞ Sul. æther, ℥ i.
Pul. camph. ℥ ij.
Pul. alum. ℥ ij. *Misce.*

A sufficient quantity of either of the above mixtures may be introduced into the tooth by means of a bit of lint or raw cotton. This should be renewed once a day until relief is obtained. These are among the best preparations for affording temporary relief, that I have ever used, and so immediate is the result, that they often seem to act like a charm. I do not, however, recom-

mend them as certain remedies ; for the pain is liable to recur after they have been applied and removed ; and, in many instances, they have failed altogether.

Some writers advise the destruction of the nerve of the tooth, when it becomes exposed. To effect this, many plans have been proposed ; but, on account of the numerous failures that have attended them, the practice has now fallen into much disrepute. The principal means recommended is, the use of the *drill*, the application of the actual cautery, the nitrate of silver, arsenic, and the nitric, sulphuric, or muriatic acid.

The use of the cautery may often be successful ; but, inasmuch as it almost always produces inflammation in the investing and alveolar membranes, it should never be recommended. The nitrate of silver seldom succeeds ; and usually, it increases the pain and inflammation. The same may be said of the application of the nitric, sulphuric, or muriatic acid. The employment of arsenic, if applied directly to the nerve, will always succeed ; but, it is objectionable for the reason assigned in another place.

The pain, it is true, will be removed by the destruction of the nerve ; it however, not only renders the tooth useless, but it, in the majority of cases, causes it to become a source of morbid irritation. The propriety, therefore, of the employment of remedies of any kind for this purpose, except to a front tooth, may be looked upon as exceedingly questionable.

The morbid influence exerted by a dead tooth, is generally in proportion to the number of its fangs, and the want of attention to its cleanliness ; consequently, as the front teeth have each but one root, and are more readily kept clean, they will not, if deprived of their vitality, become so hurtful to their relative parts, or to the economy in general, as teeth that are situated farther back in the mouth. Moreover, the nerve of a front tooth can be almost instantaneously destroyed by means of a small drill, without the danger of causing subsequent inflammation in the alveolar periosteum.

Tooth-ache, occasioned by inflammation in the lining membrane of a tooth, in other respects sound, is often of the severest and

most protracted kind, especially when it is followed by suppuration, for then a constant irritation is kept up in the adjacent parts. In cases of this kind, it is advisable to open a communication with the cavity through which the pus may be discharged. This opening should not be closed, else the matter will re-accumulate, and the relief be but temporary.

In the treatment of inflammation of the periosteum, of the roots and of the alveolar membranes, all irritants should be at once removed; after which, leeches should be applied to the gums, and fomentations to the face. The mouth should also be washed with an astringent and detergent lotion, three or four times a day. Cataplasms of the seeds of the *Hyoscyamus*, and also of the mustard plant, are recommended as proper applications for the face; they will often afford considerable relief; but, I am of the opinion, that hot salt, moistened with vinegar and laudanum, is far preferable to any other external application.

When the pain is produced (as often happens) by a disordered state of the stomach, a cathartic generally affords relief. But, if it be dependent on long continued nervous irritation of the general system, tonics, gentle exercise, change of air, and such other constitutional remedies, as the peculiarity of the case may indicate, should be prescribed by the regular physician. Local applications, in cases of this sort, are of but little service. They may, however, sometimes be used as auxiliaries.

There are two operations, that have been recommended for the cure of tooth-ache, which it may be well to notice. One of them is, the excision of the crown of the aching tooth; and the other, its partial extraction and immediate replacement in its socket.

The former of these operations, a few years ago, obtained considerable popularity with the surgeons and dentists of Europe, from its having been recommended by Mr. Fay, in a communication made to the London Society of Arts. It was supposed that the crown of the tooth might, by this operation, be cut off low enough to remove the entire pulp, and thus not only give immediate relief from pain, but also prevent its future recurrence. The advocates of the practice, however, were soon disappointed;

for it was found, that the roots which remained, were just as liable to ache afterwards, as before the removal of the crown. In consequence of this, the practice has been abandoned, except upon the front teeth.

The partial luxation and replacement of a tooth in its socket, as spoken of by Mr. Fox, for the cure of tooth-ache, was attended with no better success. He supposed, that by severing the vascular and nervous connection of the tooth, its liability to ache would be prevented, and his hopes of success, were, at first, very sanguine, but the result of the operation disappointed his expectations; he found that, although the paroxysms of pain were not so violent as before, yet the tooth soon became sore, and protruded from its socket. He, therefore, never afterwards performed the operation, except under the most favourable circumstances.

Subsequent experiments have not placed this operation in a more favourable light. The socket is generally much injured by the unnatural evulsion of the tooth, especially if it be a molaris with bifurcated fangs. An inflammation of the lining membrane, and an effusion of lymph, follow,—the membrane becomes thickened, and the tooth, in consequence, is protruded out of its socket, so that, at each occlusion of the jaws, it strikes its antagonist before the other teeth come together, and thus keeps up a constant irritation, and involves the adjacent parts in an unhealthy action.

My own observations have convinced me, that the chances of success with this operation, even under the most favourable circumstances, are so uncertain, that it ought never to be attempted. In truth, it is now seldom ever performed, except by ignorant or inexperienced practitioners.

CHAPTER FOURTH.

OF THE EXTRACTION OF TEETH.

ALTHOUGH the extraction of a tooth is generally regarded as an operation of comparatively little importance, there are few operations in surgery, that excite stronger feelings of dread, and to which most persons submit with greater reluctance. Many endure the tortures of tooth-ache for weeks and months together, rather than undergo the operation of having a tooth extracted. This, with many persons, is the last resort, and the accidents that daily result from the operation, in the hands of the ignorant and unskilful, have contributed no little to excite the fears of almost every one. The extraction of a tooth, however, when done by a skilful hand, and with a suitable instrument, is both a safe and an easy operation, but if attempted by an ignorant and unexperienced practitioner, it may be attended with serious and even dangerous consequences.

Dr. Fitch relates a case which will serve to illustrate the above remarks. The subject was a man residing in Bottetourt county, Virginia, and in attempting to have the second superior molaris, of the right side, extracted by a blacksmith, "the fangs of this tooth," says Dr. F., "were greatly bifurcated and dovetailed into the jaws, and would not pass perpendicularly out, though a slight lateral motion would have moved them instantly. The jaw proved too weak to support the monstrous pull upon it, and gave way between the second molar tooth and first molar, and instantly both the anterior and posterior plates of the antrum gave way. The fracture continued to the spongy bones of the nose, and terminated at the lower edge of the socket of the left front incisor, carrying out with the jaw, six sound teeth, namely, the first molar, the two bicuspides, one canine, one lateral, and one front

incisor, six in all. The soft parts were cut away with a knife. A severe hæmorrhage ensued, but the patient soon recovered, though with excessive deformity of his face and mouth.”*

Dr. Cross, of Jackson, Northampton county, North Carolina, related to me in 1838, a case so very similar, to the one just quoted, that I was inclined to believe that it was the same, until I recollected that the one occurred in Virginia, and the other, in the county in which Dr. C. resides. The operator in this, as in the other instance, was a blacksmith, who, in attempting to extract one of the superior molar teeth, brought away a piece of the jaw, containing five other teeth, together with the floor, and the posterior and anterior plates of the antrum. The piece of bone thus detached, is now in the possession of a physician residing about eight miles from Jackson.

I have adverted to these cases, merely to show the impropriety and danger of entrusting the operation to individuals possessing neither knowledge of its principles, nor skill in its performance. Injuries of the jaws, occasioned by the operations of such persons, have frequently come under the immediate observation of the author, to whom it has always been a matter of surprise, that an operation to which such an universal repugnance is felt, should ever have been confided to them.

The removal of a wrong tooth, or of two, and even three, instead of one, are such common occurrences, that it were well if the precautions given by the illustrious Ambroise Paré, met with more strict attention. So fearful was he of injuring the adjacent teeth, that he always isolated the tooth to be removed, by the use of the file, before he attempted its removal. He regarded it as of the greatest importance, that a person, who extracted teeth, should be expert in the use of his “tooth mullets; for,” says he, “unless he knows readily and cunningly how to use them, he can scarcely so carry himself, but that he will force out three teeth at once.” Although great improvements have been made, since his time, in the construction of instruments for the extraction of teeth, yet even now the accidents to which he alludes, are of almost daily occurrence.

* Fitch's Dental Surgery, p. 347.

It is truly surprising, that an operation which is so frequently required as this, should receive so little attention from medical practitioners, by whom, though not strictly belonging to their office, it must frequently be performed. This neglect can only be accounted for, by the too general prevalence of the supposition, that little or no surgical tact is necessary for its performance. But every physician residing in the country, or where the services of a skilful dentist cannot be commanded, should provide himself with the proper instruments, and make himself acquainted with the manner of performing the operation.

OF THE INSTRUMENTS EMPLOYED IN THE OPERATION.

Different operators employ different instruments. For about fifty years, the key of *Garengéot* was almost the only instrument used in the performance of the operation, but recently, this, in a great measure, has been superseded by forceps, which, when properly constructed, are far preferable, yet, as the key is still used by some practitioners, it may be well to give a brief description of it.

OF THE KEY INSTRUMENT.

The common tooth-key may be regarded in the light of a wheel and axle; the hand of the operator acting on two spokes of the wheel, to move it, while the tooth is fixed to the axle by the claw, and is drawn out as the axle turns. The gum and alveolar process of the jaw, form the support on which the axle rolls.—*Arnott.*

Different dentists have their keys differently constructed, yet the principle upon which they all act is precisely the same. Some prefer the bent shaft, others the straight. Some give a decided preference to the round fulcrum, others to the flat. And though the success of the operator depends greatly upon the perfection of the instrument, yet he can much more expertly remove a tooth, by means of a key with which he is familiar, than one to which he is unaccustomed, though its construction be even better.

The author has tried almost every variety of key-instruments that have been used in this country, and he is of the opinion that

the straight shank with a small round fulcrum, is decidedly preferable to any other. The objection raised, to its use, by some, that it is liable to interfere with the front teeth, is without good foundation. It can be used with as much safety as a key of any construction, and in most cases can be more easily applied. The round is certainly preferable to the flat fulcrum, because it is less liable to injure the gum and alveolus. Its size should be about that of a half ounce bullet.

Every key instrument should be supplied with several hooks, differing in size, to correspond to that of the teeth upon which they are to be applied. The hook described by Dr. Maynard in No. 3, Vol. 3 of *Am. Jour. of Dental Science*, is preferable to any I have seen. It very nearly resembles the eagle's claw, except that its curvature is rather greater. The edge of the point is about the sixteenth of an inch in width, and divided into two points, by a shallow notch filed in the centre. A hook of this description is much less liable to slip, and can be more readily applied to a tooth than those ordinarily used.

OF THE FORCEPS.

Forceps were not very generally or extensively employed, except for the extraction of the front teeth, until within the last fourteen or fifteen years, but the improvements that have been made in their construction, during this period, are so great, that their use has now, among dental practitioners, almost altogether superseded that of the key.

The forceps formerly used, were so awkwardly shaped, and badly adapted to the teeth, that the extraction of a large molar with an instrument of this description, was regarded as so exceedingly difficult, and even dangerous, that, sixteen years ago, its practicability was doubted by many of the most experienced practitioners, and hence, the key was almost the only instrument resorted to for this purpose.

And, when we consider the strong prejudices, that so recently existed, to the use of the forceps, it is not at all wonderful that their use should have been admitted by the profession with caution. Nor is it surprising that a gentleman of Mr. Bell's intelligence and

practical experience, should, so late as the period of the publication of his work, 1830, tell us, that the key is the only instrument to be relied on for the removal of teeth that are much decayed, and that those, who have heaped the most opprobrium upon it, are glad to have a concealed recourse to its aid.

This may have been true at the time Mr. B. wrote, but it is not now. On the contrary, cases are daily occurring of the extraction of teeth with the forceps, upon which the key had been previously unsuccessfully employed. It is generally supposed, that a greater amount of force is necessary to remove a tooth with the forceps, than with the key, but this is a mistake. It does not ordinarily require as much. All that is gained by the lever action of the key, is more than balanced by the greater amount of resistance encountered in the lateral direction of the force exerted by that instrument in the removal of the tooth. But with the forceps, the direction of the force being perpendicular, either upwards or downwards, as the tooth may happen to be in the upper or lower jaw, a sufficient amount only to break up the connection with and to overcome the resistance of the walls of the alveolus, is required.

The author has used forceps, to the exclusion of the key, for about eleven years, and he does not hesitate to affirm, that any tooth that can be extracted with the latter, can also be removed with the former, if properly constructed, and that too, in the majority of cases, with greater ease to the operator, and less pain to the patient. He knows that in the expression of this opinion, he differs from many of his professional brethren; and that there are many skilful and experienced practitioners, who, while they prefer the forceps for the extraction of most teeth, still occasionally use the key. But he is confident, that, if they would provide themselves with forceps properly constructed for the extraction of the teeth, which they now remove with the key, and use them for six months to the exclusion of that instrument, they would never employ it again. He could mention the names of more than thirty, who, at his instance, have done this, and the result has been, that all of them have wholly abandoned its use.

It may perhaps require a little more practice to become skilled in the use of forceps, than in that of the key. I would, there-

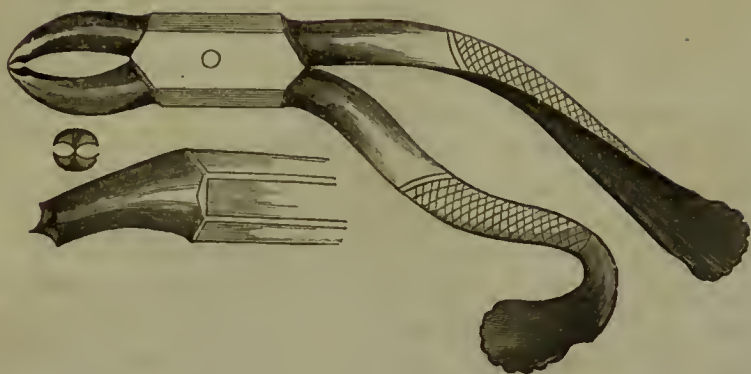
fore, advise those who have been accustomed to the key, not to lay it at once entirely aside; but to commence the use of the forceps on teeth that are least difficult to remove, as, for example, the bicuspidés, and then afterwards upon the molares.

But, in order that the forceps may be used with ease, it is necessary that they should be of a proper shape and construction. Every operator should possess several pair, (seven at least,) each with a differently shaped beak, so as to fit the necks of the teeth to which they are respectively designed to be applied.

For the extraction of the molares, the forceps recommended by Mr. Snell, are the best in use. His forceps, for the upper molares, are two in number, one for each side, curved just below the joint, so that the blades of the beak will form an angle, with the handles, of about twenty or twenty-five degrees, just enough to clear the lower teeth. The inner blade is grooved so as to fit the palatine side of the neck of one of these teeth; the outer blade has two grooves with a point in the centre to fit the depression just above the bifurcation of the two outer fangs.

Each blade of the beak of his lower molar forceps has two grooves, with a point in the centre, so situated, that in grasping the tooth, it comes between the two roots just at the bifurcation. Mr. Snell employs two pair for the extraction of the lower, as well as for the upper molares, in order, as he says, to have a "hook to turn round the little finger," which he supposes must be on opposite sides of the instrument. But this is rendered unnecessary by an improvement made by the author nearly twelve years ago, consisting in having the handles of the instrument so bent that it may be as readily applied to one side of the mouth as the other, while the operator occupies a position at the right and a little behind the patient. By this improvement, the necessity for two pair is wholly superceded, and it moreover enables the operator to control the head of his patient with his left arm, and the lower jaw with his left hand.

FIG. 43.

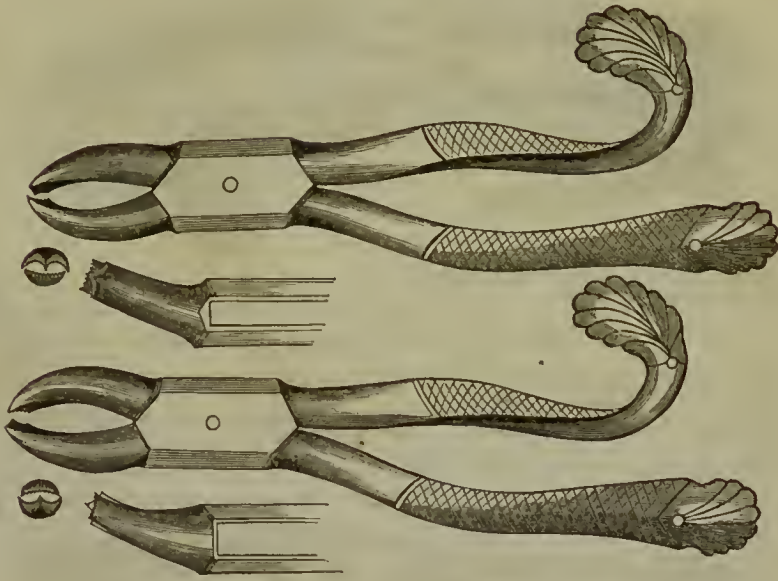


The shape of the instrument, as improved by the author, is exhibited in the accompanying engraving, and all who use it thus improved, and it is now used by hundreds, prefer it to any other instrument they have ever employed for the extraction of the lower molar teeth. When applied to a tooth, the handles, as may be perceived, turn toward the operator, forming an angle with the median line of the mouth, of about twenty-five or thirty degrees. Without this curvature in the handles of the instrument, the arm of the operator would often be thrown so far from his body, as to prevent him from exercising the control over it, oftentimes required in the performance of the operation. And while it is important that they should be bent in the manner here represented, they should, at the same time, be wide and accurately fitted to the hand.

The improvements made by Mr. Snell in the shape of the beaks of the upper and lower molar forceps, are very valuable, and for them he is entitled to much credit—more than the profession, generally, seem willing to award. Another, and very valuable improvement of his, consists in having one of the handles bent so as to form a hook. This passes round the little finger of the hand of the operator, to prevent it from slipping. In the drawings which Mr. Snell has given of his superior molar forceps, the hook is on the palatine handle of each, so that in the extraction of a right upper molaris, the upper side of the instrument must be grasped, and the lower side in the extraction of a left upper

molaris. But the author has found, that by having the handle so bent, that when applied, the hook of each is next the opera-

FIG. 44.



tor, they can be more conveniently employed; and, as in the case of the lower molar forceps, the handles should be wide, and large enough to prevent them from springing under the grasp of his hand; to which, too, they should be accurately fitted. The beaks should be bent no more than is absolutely necessary to prevent the handles from coming in contact with the teeth of the lower jaw; for, in proportion to the greatness of the curvature, will the force required to be applied to the instrument, be disadvantageously exerted. Every dentist therefore, in having forceps manufactured, should give special directions with regard to their shape and size. For the extraction of the superior molares, two forceps, as has before been stated, are necessary; one for the right and one for the left side, as represented in Fig. 44.

For the extraction of the upper incisors and cuspidati, one pair of forceps only, is necessary. These should be straight, with grooved or creseent-shaped jaws, accurately fitted to the necks of

the teeth. They should also be thin, so, that when it becomes necessary, from the decay of the tooth, they may be easily intro-

FIG. 45.



duced under the gum, up to the edge of the alveolus. And like the superior and inferior molar forceps, the handles should be large enough to prevent them from springing in the hand of the operator, and a hook should also be formed at the end of one of them.

FIG. 46.

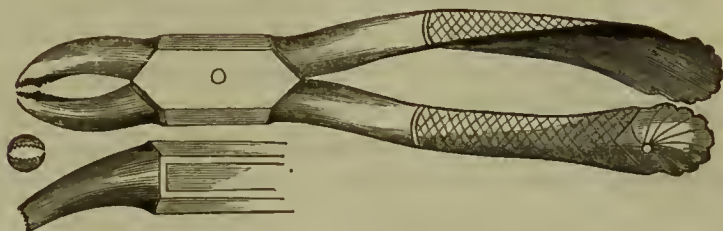


For the extraction of the lower incisors, a pair of very narrow beaked forceps are necessary, in order to prevent interfering with the teeth adjoining the one to be removed. The beak, above the joint of the instrument, should be bent downward so as to form an angle of about twenty-five degrees, with the handles, (see Fig. 46.) This too, is one of the most useful instruments that can be employed for the extraction of the roots of teeth.

Forceps for the extraction of the bicuspidates, should have their jaws so bent, as to be easily adapted to these teeth; they should be narrow, and have a deeper groove on the inside than those for the upper incisors and cuspidati, and like them they should be thin, yet strong enough to sustain the pressure which it may be

necessary to apply to them. One pair will answer for the bicuspidates of both jaws, but when only one pair is employed, both

FIG. 47.

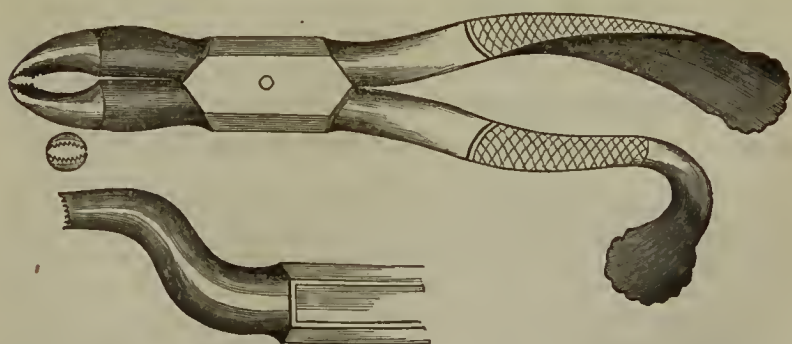


handles must be straight. The engraving, Fig. 47, represents the instrument here described.

For the removal of the cuspidati of the lower jaw, the hawk's-bill forceps, with crescent-shaped beaks, are often employed, but the instrument last described, and represented in Fig. 47, is better suited for the extraction of these teeth, and can be more conveniently applied and used, than these. No other instrument, therefore, is required for the removal of the inferior cuspidati.

The *dentes sapientiæ* also, in a large majority of the cases, can be as readily extracted with the bicuspid forceps, as any other, and these can be as conveniently applied to the teeth of the upper as to those of the lower jaw.

FIG. 48.



But there is another kind of forceps, which can be employed for the removal of the upper *dentes sapientiæ*, when the bicuspid

forceps cannot be applied. The beak of these is bent above the joint, so as to form nearly two right angles, as shown in Fig. 48. These forceps, I believe, were invented by the late Dr. Edward P. Church,* about sixteen years ago, and in those cases where the superior dentes sapientiæ are considerably shorter than the second molares, they can be successfully and advantageously employed, and oftentimes when they cannot be reached with any other extracting instrument. These forceps are also useful in the extraction of roots of teeth, when situated behind a bicuspid or molar tooth which has a very long crown.

A great variety of forceps and other instruments have been invented, and are used for the extraction of teeth; but, the author has not seen any comparable with those which he has just described. Seven pair are all that are really necessary in the performance of the operation; and these, if properly constructed, are better and more efficient than thirty pair of the awkwardly contrived forceps which many practitioners use.

The handles of a pair of forceps should be no longer than absolutely necessary for the accommodation of the hand of the operator.

In conclusion, I would remark, that Mr. Arnold, Dental and Surgical Instrument Maker, of Baltimore, is in possession of patterns of all the forceps which I use; and that he manufactures them in the neatest and most substantial manner.

OF THE MANNER OF USING THE KEY INSTRUMENT.

The directions required for the use of the key are few and simple; but, as cases frequently present themselves, to which no

*Dr. Church was an ingenious and talented man, and during his brief professional career,—a period of about four years, he acquired a reputation for skill, which but few, in so short a time, have ever been able to achieve, and had his life been spared, he would at this time have ranked among the very first practitioners in the country. Born in the western part of the state of New York, he chose the Mississippi Valley as a temporary field for his professional labours, intending ultimately to locate in Cincinnati, but during the prevalence of the Asiatic cholera, in 1832, he fell a victim to this ruthless destroyer, while on a visit to his family, in New York, in the 26th or 27th year of his age.

general rules can be applied, much will depend on the practical judgment and surgical tact of the operator. The first step to be taken in the operation, is to separate the gum from the neck of the tooth down to the alveolus, and this should be done, not only on two sides, but all round. For this purpose, suitable knives should be provided. On the approximal sides of the tooth, a straight narrow bladed knife, pointed at the end, and with one cutting edge, will be found most convenient and effectual, in performing this part of the operation; and it should be used as described by Dr. Maynard, by passing the point in between the neck of the tooth and gum, down to the alveolus, with its back downwards, and cutting from the direction of the roots towards the coronal extremity of the tooth. In this way, the adhesion of the gum to the anterior and posterior sides of the neck of the tooth may be thoroughly severed. The same kind of knife or common gum-lancet, may be used for separating the gum from the lingual or palatine, and labial sides of the tooth. If this precaution be neglected, there will be danger of lacerating the gum in the removal of the tooth.

After the tooth has been thus prepared, the key, with the proper hook attached, should be firmly fixed upon it; the bolster, on the inside, resting upon the edge of the alveolus, the extremity of the claw, on the opposite side, pressed down upon the neck. The handle of the instrument should now be grasped with the right hand, and the tooth, by means of a firm, steady rotation of the wrist, raised from its socket. In order to prevent the claw from slipping, (an accident that too frequently occurs,) it should be pressed down with the forefinger or thumb of the left hand of the operator, until, by the rotation of the instrument, it becomes securely fixed to the tooth.

If the tooth be situated on the left side of the mouth, the position of the operator should be at the right side of the patient; but, if it be on the right side of the mouth, he should stand before him.

For the removal of a tooth, on the left side in the lower jaw, or the right side in the upper, the palm of the hand should be beneath the handle of the instrument; and *vice versa*, in the extraction of one on the right side in the lower jaw, or on the left

side in the upper. The manner of grasping the instrument is perhaps of more consequence than many imagine. If it be not properly done, the operator loses, to a great extent, his control over the instrument, and applies the power to it disadvantageously.

The directions here given, are, in some respects, different from those laid down by other writers; yet, I am convinced from much experience, that they will be found more conducive to the convenience of the operator and the success of the operation.

There is a great diversity of opinion as to whether a tooth should be removed inwards or outwards. Some direct the fulcrum of the instrument to be placed on the outside of the tooth, others on the inside, while others again, regard it as of but little importance on which side it is placed. But experience has taught me that the fulcrum should generally be placed on the inside, especially of the lower teeth, as they almost always incline towards the interior of the mouth. Moreover, the alveolar parietes of these teeth are usually a little higher on the exterior edge of the jaw than on the interior; so, that the first motion of the instrument, with its fulcrum on the outside, brings the side of the tooth against its socket, and thus, nearly double the quantum of power is required to remove it; while, at the same time, the pain of the patient, and the chances of injury to the alveolar processes, are very much increased.

The alveolar walls of the upper teeth are generally like those of the lower, except that they are much thinner, and thus do not afford so strong a support to the fulcrum of the instrument.

It is, however, frequently necessary to place the bolster of the instrument on the outside of the tooth; especially when it is decayed in such a way, that there is not a sufficiently firm support for the claw of the instrument on this side of the tooth. But, whenever it is possible to remove a tooth inwards, it should always be done.

OF THE MANNER OF USING THE FORCEPS.

In describing the manner of using these instruments, I shall commence with the extraction of the incisors of the upper jaw. These are generally more easily removed than any of the other teeth.

After separating the gum, in the manner as described in another place, from the neck of the tooth, the tooth should be grasped with a pair of straight forceps, like those represented in Fig. 45, and pressed several times, in quick succession, outwards and inwards, giving it at the same time, a slight rotary motion, which should be continued until it begins to give way; when, by a slight depression of the hand, it is easily removed.

If the tooth is much decayed, it should be grasped as high up under the gum as possible, and no more pressure applied to the handles of the instrument, than may be necessary to prevent it from slipping. Teeth are often unnecessarily broken by not attending to this precaution.

The same directions will, in most cases, be found applicable, for the removal of a lower incisor. But the arrangement of these teeth are sometimes such as to render their extraction rather more difficult. The forceps best calculated for the removal of these teeth, are represented in Fig. 46.

For the extraction of a cuspidatus, much greater force is usually required, than for the removal of an incisor. The straight forceps, (see Fig. 45,) should be employed for the removal of the superior, and curved-beaked forceps, (see Fig. 47,) for the inferior cuspidati. But in the extraction of one of these teeth, less rotary motion should be given to the hand than in the removal of a tooth situated in the front of the mouth. In every other respect, the operation should be conducted in the same manner. The inferior cuspidati generally have longer roots, and are usually more difficult to remove than the superior.

Very little rotary motion can be given to a bicuspis, especially an upper, in its extraction. After it has been pressed outwards and inwards several times, or until it begins to give way, it should be removed by depressing or elevating the hand, as it may happen to be in the upper or lower jaw; but in either case, the forceps represented in Fig. 47, are the proper instruments to be employed in the operation, except the crown has become so much weakened by decay, as to be unable to bear the requisite amount of

pressure. In this case, the gum should be separated on each side, from the alveolus, about an eighth or three-sixteenths of an inch above its margin, and slitted so as to admit of the application of the narrow-beaked forceps, Fig. 46. With these, the alveolar walls on each side, may be easily cut through, and a sufficiently firm hold, obtained upon the root of the tooth, for its removal. These forceps will also be found the most efficient instruments for the removal of any of the back teeth or the cuspidati when in a similar condition, that can be employed.

The upper molares, having three roots, generally require a greater amount of force for their removal than any of the other teeth. They should be grasped as high up as possible, with one of the forceps represented in figure 44, and then pressed outwards and inwards, until they become well loosened, when they may be pulled from their sockets. If the forceps used for the extraction of these teeth, are of the right description, and properly applied, they will be found the safest and most efficient instrument that can be employed for their removal.

The superior dentes sapientiæ are generally less firmly articulated to the jaw than are the first and second molares, and are, therefore, more easily removed than either of the last mentioned teeth. When their crowns are sufficiently long to admit of being grasped with the bicuspid forceps, (see Fig. 47,) they should be removed with this instrument, but when it cannot be applied without interfering with the teeth anterior to these, the forceps represented in engraving 48, should be substituted.

The inferior molares, although they have but two roots, are often very firmly articulated, and require considerable force for their removal, and it sometimes happens, that when the approximal side of one has been destroyed by caries, the adjoining tooth has approached it, and rests on it in such a manner as to constitute a formidable obstacle to its extraction. Two teeth are often removed in attempting to extract one when thus situated, when the precaution of filing the side of the encroaching tooth has not been previously used. This should never be omitted, in the extrac-

tion of a lower molaris or bicuspid, when locked down in the manner just described. And, though less frequently, it sometimes happens the upper teeth fall over against each other in the same manner, and when this occurs, the adjoining tooth should be filed sufficiently to liberate the one that is to be extracted, before attempting its removal. In applying the forceps to an inferior molaris, the points on the ends of the blades of the beak of the instrument should be forced down between its roots, and, after having obtained a firm hold, the tooth should be forced outwards and inwards, several times, until its connection with the jaw is partially broken up, and then lifted from its socket. If the tooth has decayed off down to its neck, the upper edge of the alveolus may be included between the points of the beak of the instrument, through which they will readily pass on applying pressure to the handles, and in this manner a secure hold will be obtained upon the tooth. The same should also be done in the extraction of a superior molaris when in this condition.

The dentes sapientiæ in the lower jaw, when situated far back under the coronoid processes, are oftentimes exceedingly difficult to extract, but with forceps, like those represented in Fig. 47, they may always be grasped, by a little tact on the part of the operator, except in those cases where their crowns have been destroyed by caries, when a portion of the alveoli should be cut away, either with the forceps, or a strong sharp-pointed instrument, previously to attempting their removal. It occasionally happens, too, that the roots of these teeth are bent in such a manner as to constitute a considerable obstacle to their removal. But, when this is the case, the roots are almost always turned posteriorly towards the coronoid processes, so that after starting one of these teeth, if the operator is unable to lift it perpendicularly from its socket, he will have reason to suspect its retention to be owing to an obstacle of this nature. To overcome this, as he raises his hand, he should push the crown of the tooth backwards, so as to make the tooth, in its passage from the alveolus, describe the segment of a circle; for, should he persist in his efforts to remove it directly upwards, the root will be broken and left in the jaw.

It sometimes happens, too, that the roots of the first and second molares of both jaws, and those of the superior dentes sapientiæ, are bent, or diverge, or converge so much as to render their extraction exceedingly difficult. The convergency of these is often so great, that in their removal the intervening wall of the alveolus is brought away, but neither from this, nor from the removal of a portion of the exterior wall, does any unpleasant consequences ever result. Similar mal-conformations are occasionally met with in the roots of the bicuspidæ, the cuspidati, and even incisor teeth.

Other obstacles sometimes present themselves in the extraction of teeth, which the judgment and tact of the operator only, will enable him to overcome. The nature and peculiarity of each case, will suggest the method of procedure most proper to be pursued in the performance of the operation. The practitioner should never hesitate, whenever it is necessary to enable him to obtain a firm hold upon the tooth, to embrace a portion of the alveolus between the beak of his forceps. The removal of the upper edge of the socket, is never productive of injury, as it is always, soon after the extraction of the tooth, destroyed by a peculiar operation of the economy. By this means, when the crown of the tooth has become so much weakened by disease as to be unable to bear the pressure of the instrument, it may, in every instance, be immediately removed; and that too, without inflicting upon the patient, half the amount of pain, that would be caused by attempting to remove it in any other manner. Finally, I would remark, that in every instance, the gum should be completely separated from the neck of the tooth, before any attempt is made to extract it.

OF THE MANNER OF EXTRACTING ROOTS OF TEETH.

The extraction of roots of teeth is sometimes attended with considerable difficulty; but generally, they can be more easily removed than whole teeth, and especially those of the molares, for after the destruction of their crowns, an effort is usually made by the economy to expel them from the jaws. This, as has been stated in another place, consists in the gradual destruction and

filling up of the socket, by a deposition of ossific matter at the bottom, whereby the articulation of the root becomes weakened, and its removal rendered proportionably easier. The alveolar cavities are often wholly obliterated in the course of two or three years after the destruction of the crowns of the teeth, and the roots retained in the mouth, simply by their connection with the gums, so that for their removal, little more is necessary than to sever this bond of union with a gum lancet.

The instruments usually employed in the extraction of roots of teeth, are, the hook, punch, elevator and screw; all of which are too well known to need any description. Although every dentist has them made to suit his own peculiar notions, the manner of using them, and the principle upon which they act, are the same. It will therefore be sufficient to say, that they should be of a convenient size, made of good steel, and so tempered as neither to bend nor break.

The hook is chiefly used for the extraction of the roots of the molar and bicuspid teeth on the left side of the mouth; the punch, for the removal of roots on the right side; the elevator for the extraction of roots on either side, as occasion may require; and the screw for the removal of the roots of the upper front teeth.

Considerable tact is necessary for the skilful use of these instruments, and this can only be obtained by practice. Great care is requisite in using the punch and elevator, to prevent them from slipping and injuring the mouth of the patient. Whenever therefore, either of these are used, the forefinger of the left hand of the operator should be wrapped with a cotton or linen rag, and placed on the side of the root, opposite to that against which it is applied, so as to catch the point of it in case it should slip.

But, for the removal of the roots of the bicuspid and molar teeth, and often for those of the cuspidati and incisors, the narrow beaked forceps, recommended for the extraction of the lower incisors, (see Fig. 46,) is the most efficient and successful instrument that can be employed. When the root is decayed down to the alveolus, the gums should be separated from the latter and so much of it as may be necessary to obtain a secure hold upon the former, included between the blades of the beak of the forceps,

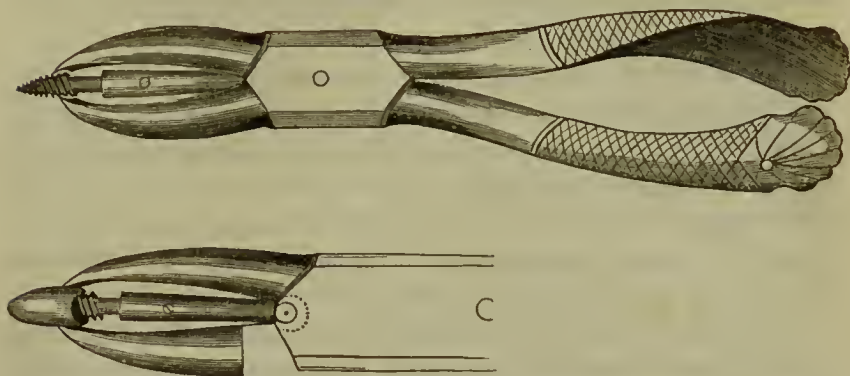
which, from their being very narrow, readily pass through it, and a firm hold at once obtained upon the root; when, after moving it a few times, outwards and inwards, it may be easily removed from the socket. There are some cases, however, when the punch, hook and elevator may be advantageously used. I have also occasionally met with cases where I have succeeded in removing roots of teeth with great ease, with an elevator shaped like the blade of a knife, by forcing it down into the socket by the side of the root, and then turning it so as to make the back press against the former and the edge against the latter. When such an instrument is used, the blade should not be more than an inch in length; and it should be straight, sharp at the point, and have a very thick back, in order to prevent it from breaking in the operation. In using the common elevator, it is necessary that there should be an adjoining tooth or root, to act as a fulcrum. When this can be obtained, a root, or even a whole tooth, may sometimes be removed with it; but as a general rule, the forceps should be preferred to any of these instruments.

For the extraction of the roots of the upper front teeth, after they have become so much funneled out by decay, as to render their walls incapable of sustaining the pressure of the forceps, the screw is invaluable. This is of a conical shape, and with it, a sufficiently firm hold can be obtained for its removal, by screwing it up into the cavity of the root. But before it is introduced, the softened decomposed bone should be removed from the interior of the root, with a triangular pointed instrument of a similar shape.

Dr. S. P. Hullihen has invented a most valuable and useful instrument for the removal of the roots of the superior incisors and cuspidati, when in the condition just described. It combines the advantages both of the screw and forceps, as may be seen by the accompanying cut. It is thus described by the author. "Lengthwise, within and between the blades of the beak is a steel tube, one end of which is open; the other solid and flat and jointed in a mortice in the male part of the joint of the forceps. When the forceps are opened, this joint permits the tube to fall backwards and forwards from one blade of the beak to the other,

without any lateral motion. Within this tube is a spiral spring which forces up a shaft two-thirds of the tube, the other part is

FIG. 49.



a well tapered or conical screw. * * * The shaft and tube are so fitted together, and to the beak of the forceps, that one-half of the rounded part of the shaft projects beyond the end of the tube; so that the shaft may play up and down upon the spring," about half an inch, and the screw or shaft be embraced between the blades of the beak of the instrument.

The instrument here represented, (see Fig. 49,) differs a little from Dr. Hullihen's, in the manner of its construction, though it acts upon precisely the same principle.

"The forceps," says Dr. H., "are used, by first embracing the shaft between the blades."* "Then screwing it as gently and deeply into the root as possible, the blades are opened—pushed up on the root, which is then seized" and extracted.

"The screw thus combined with the forceps," as is justly remarked by Dr. H., "prevents the root from being crushed. It acts as a powerful lever when a lateral motion is given; it is likewise of advantage when a rotary motion is made—it prevents the forceps from slipping, or of their action being lost, should even one side of the root give way in the act of extracting it—and is used with equal advantage where one side of the root is entirely gone."

*The author has a pair constructed so that the upper extremity of the screw, is grasped between the blades of the beak of the forceps, instead of the shaft.

The opportunities which the author has had of testing the value of this instrument, have been sufficient to justify him in stating that its merits are not overrated by the inventor. Every practitioner would therefore do well to provide himself with one of them.

The temporary teeth should be extracted in the same manner as the permanent ones, and with the same instruments. If the power be properly directed, very little force is required for their removal, because the roots of these teeth are generally more or less removed before the operation is called for, and when they remain, the alveolar processes, at this early age, are so soft and yielding, as to offer very little resistance to their extraction.

The operator should be very careful not to injure the pulps of the permanent teeth, or the jaw-bone. Serious accidents sometimes occur from an improper or awkward removal of these teeth. But, as has been before remarked, their extraction is seldom required. It should only be resorted to for the relief of tooth-ache, the cure of alveolar abscess, to prevent irregularity in the permanent teeth, or in case of necrosis of the socket.

EXCESSIVE HÆMORRHAGE AFTER EXTRACTION.

It rarely happens, that excessive hæmorrhage is occasioned by the extraction of a tooth. Indeed, it is oftener more desirable to promote bleeding by rinsing the mouth with warm water, than to attempt its suppression. Nevertheless, cases do sometimes occur, in which it becomes excessive and alarming; and it has even been known, in some instances, to terminate fatally.

Excessive hæmorrhage from the extraction of a tooth, does not appear to be dependant upon the manner in which a tooth is extracted; but seems rather to be attributable to constitutional temperament. Hence, whenever a tendency to it exhibits itself in one member of a family, it is usually found to exist in all. Of the many cases which have fallen under my own observation, I shall mention only one.

In the fall of 1834, Miss I——, a young lady of about fifteen years of age, called on me to remove the second molaris on the left side of the upper jaw. The hæmorrhage, immediately after

the operation, was not greater than that which usually occurs, and in the course of half or three-quarters of an hour, it altogether subsided. But at about twelve o'clock on the following night, it commenced again, in such a manner as to excite considerable alarm. A messenger was immediately sent to ask my advice, and I directed the alveolar cavities to be filled with pledgets of lint, saturated with the tinct. of nut galls. Two days after, at about six o'clock in the morning, I was hastily sent for by the young lady's mother, and, on my arrival at her residence, I was informed that the bleeding had then been going on for about four hours; and, that during this time, more than two quarts of blood had been discharged. The blood was still oozing very fast. After I had removed the coagulum, I filled the alveolus with pieces of sponge, saturated, as the lint had been, with tinct. of nut galls. When the pieces of sponge had been firmly pressed in, and secured by a compress, the hæmorrhage immediately ceased. These were permitted to remain until they were expelled by the suppurative and granulative processes.

I afterwards had occasion to extract a tooth for a sister, and two for the mother of the young lady, and a bleeding similar to that just described, occurred in each case.

I have had, perhaps, some fifteen or twenty cases of this description; but, never found it necessary to adopt any other course of treatment than that detailed in the case just narrated. More powerful remedies, however, are sometimes employed. Some use a solution of the sul. cupri, or of the nitrate of silver, while others employ the actual cautery. Pressure, after all, I believe, is the only thing on which we can rely. If it be so applied, as to act directly upon the mouths of the bleeding vessels, it will be found to be more efficacious than the most powerful styptic, or any other remedy.

The following case is quoted by Dr. Fitch, from *Le Dentiste Observateur par H. G. Courtois, Paris, 1775*.

"A person, living in Paris, called on me to extract a canine tooth for him. On examining his mouth, I thought that this man was attacked with scurvy; but, this did not seem sufficient to hinder the person from having his tooth extracted, much less would he have consented to it, on account of the pain which his

tooth gave him. After the tooth was extracted, it did not appear to me that it bled more profusely than is customary after similar operations. In the meanwhile, the following night I was called upon to see the patient, who had continued to bleed ever since he left me. I employed, for stopping this hæmorrhage, the agaric of the oak bark, which I commonly used with success. The following day I was again sent for; the bleeding still continued. After having disburdened the mouth of all the lint pledgets, which I used for making compression at the place where the blood appeared to come from, I made the patient take some mouthfuls of water to clear his mouth of all the clots of blood with which it was filled; I perceived, then, that the blood came no more from the place whence I had extracted the tooth, but from the gums; there was not a single place in the whole mouth from which blood did not issue. I called in the physician, who ordered several bleedings in succession to each other, besides astringents, which were taken inwardly; and gargles, of the same nature, were used; but, all these remedies, like all the others he took to give the blood more consistence, were all used to no purpose. It was not possible to stop this hæmorrhage. The patient died the ninth or tenth day after the extraction of the tooth."

Mr. Snell mentions a similar case, which also terminated fatally.

CHAPTER FIFTH.

OF ATROPHY OF THE TEETH.

THE disease designated by the term atrophy, was formerly treated of, and even is at present, by many French writers, under the name of erosion. The former appellation was substituted by M. Duval, for the latter, and for the disease which it is intended to designate, it certainly seems to be the most appropriate. By erosion is usually understood, the gradual destruction of a tooth by the action of an acrimonious humor. It consists in the decomposition of the enamel, and is seldom attended with any discolouration of the affected part. It is identical in every respect with caries; and is produced by the same cause. But atrophy is characterized by a white, brown, or yellow spot upon the enamel, or a number of small holes in it; and the last variety is more common than the first. These sinuosities form one and sometimes two or three horizontal lines across the anterior surfaces of two or more of the teeth, and frequently extend entirely around them. The holes are often united, and form a sort of rough groove. They sometimes extend only a short distance into the enamel; at other times, they penetrate entirely through it, and into the subjacent osseous tissue. They usually have a brown appearance; and, in the majority of cases, their walls are rough and uneven, though they are sometimes quite smooth.

The bone as well as the enamel of the teeth is often affected with the disease. The crowns of atrophied teeth are sometimes not more than half or one-third of their usual size. In this case, the enamel in some places is entirely wanting, while in others, it is more or less perfect, except that it usually has a brownish appearance, and is less hard.

In the variety first spoken of, the enamel is often so soft as

readily to crumble under the pressure of an instrument. This description may be congenital or accidental—the other varieties are always congenital, as they never occur after the birth of the tooth.

The first variety rarely affects more than one or two teeth—the other varieties, except that which is characterized by a diminution of the size of teeth, always affects two, and sometimes four or six or even eight of the teeth. It rarely, however, appears upon more than four teeth in the same jaw.

The incisors are more liable to be affected by it than any of the other teeth, though the cuspidati, bicuspidates and even the molares are sometimes attacked with the disease. The crowns of the teeth are the parts most frequently affected by it, yet nevertheless it sometimes appears upon the roots, giving them a shriveled and uneven appearance.

CAUSES.

The description of atrophy first noticed is evidently the result of the destruction of the bond of union between the enamel and the osseous tissue of the tooth, but what causes this destruction, especially when it occurs previously to dentition, is a question that has never been satisfactorily answered. Subsequently to this period, it may result from a blow, but while the teeth are imbedded in the jaws it could not be produced in this way. It may however, and very likely does, result either from inflammation of or some other diseased action in the pulp, whereby some portion of this intermediary substance is prevented from being developed or from becoming united in every part to the animal framework of the enamel. The other descriptions of atrophy are supposed to be the result of vicious nutrition, caused by eruptive and other febrile diseases. Bunon ascribes it to an acrid humor, insinuating itself into the alveolus. The fluids of the dental capsules may become acidulated and produce erosion, the name by which he designates the affection in question, but not this disease. M. Delabarre seems also to have confounded atrophy with erosion, although he endeavours to point out the distinction that exists between the two diseases, but most of the drawings which he gives of teeth affected with the latter, are evidently marked with the former.

Atrophy, characterized by an imperfect development of one or more of the teeth, discolouration of the affected parts, and sinuosities in the enamel, such as have been described, is, I am disposed to believe, the result of constitutional disease at the time of the commencement of ossification of the pulp and the formation of the enamel. When ossification has preceded the attack, the part of the enamel only, which was, at the time, in the act of formation, will be affected. If after the lapse of a few weeks, and before the completion of the formation of the enamel, the child should relapse, or be attacked with any other description of constitutional disease, capable of disturbing this process, another longitudinal groove or row of holes will be formed, and still another, if again attacked. The kind of constitutional disease supposed to be most liable to produce this effect, is measles and small-pox. But cases of atrophied teeth are met with in individuals, who have never been affected with either of these diseases. It is evident, therefore, that it may result from other forms of general disease.

TREATMENT.

The nature of this affection is such as not to admit of cure. The treatment, therefore, must be preventive rather than curative. All that can be done is to mitigate the severity of such diseases as are supposed to produce it by the administration of proper remedies. By this means, the effects, may, perhaps, be partially or wholly counteracted.

It seldom happens that atrophied teeth decay more readily than others, so that the only evil resulting from the affection, is a disfiguration of the organs. When the cutting edges of the incisors only are affected, the diseased part may sometimes be removed with a file without inflicting the slightest injury on the teeth.

CHAPTER SIXTH.

OF NECROSIS OF THE TEETH.

By the term neerosis, when applied to the teeth, is meant the entire death of one or more of these organs. It is a disease common to all bones, and is similar to mortification in a soft part.

When it affects other bones than the teeth, the dead part is thrown off, and the loss repaired by the formation of new bone. But, when it attacks the teeth, there is no such restoration. These organs, as has before been shown, are not endowed with recuperative powers. And even if they were, neerosis would still forever deprive them of vitality, because they, unlike other osseous structures, are affected by it, at once, in every part.

It does not in the least affect their density, but it produces so great a change in their appearance, that a tooth thus affected, may be readily detected by the most casual observer. It causes them to assume a dark, bluish, or dingy hue, and this change is more striking in teeth that are soft, than in those that are hard. It is also more marked in those that have been suddenly killed from a blow, than it is in those which have lost their vitality in a more gradual manner.

The front teeth, from their being more exposed to injuries from blows, are more liable to neerosis than those that are farther back in the mouth. It is also more frequently met with in sound teeth, than in those that are decaying. This fact may appear strange, yet I think it capable of satisfactory explanation.

It has been before shown, that soft teeth are more liberally supplied with blood vessels, nerves, &c., and are more easily acted upon by external agents, than those that are hard. Hence it will be seen, that if soft teeth, on account of their higher or-

ganization, are more susceptible to the action of corroding agents, they are also, for the same reason, less liable to be deprived of their vitality.

CAUSES.

Necrosis of the teeth may be produced by a variety of causes, such as protracted fevers, the immoderate exhibition of mercurial medicines, and by caries. The immediate cause, however, in all cases in which it is not occasioned by a blow, sufficiently violent to destroy, at once, the vascular connection of the tooth with the rest of the system, is inflammation and suppuration of the lining membrane.

When once the vascular connection of a tooth with the rest of the system is destroyed, it becomes an extraneous body—inflammation of the socket ensues, and the gum becomes turgid and spongy, and generally bleeds from the slightest touch. The tooth, as the alveolus is wasted, becomes loosened, matter is discharged, at different openings, through the gums, or at its edge, the root assumes a dark brown colour, and has a rough eroded appearance. A morbid action is also often imparted to the contiguous parts. The sockets of the adjacent teeth are frequently destroyed, the teeth loosened, and the gums swell and become spongy.

I have, in some instances, known teeth to remain firmly fixed in their sockets for years, after having been deprived of their vitality, without producing any very unpleasant consequences. Cases of this sort, however, are of so rare occurrence, especially with the molares and bicuspidæ, that I am disposed to believe, that in such instances, there is always a low degree of vitality kept up by the periosteum of the fangs, after the suppuration of the internal membrane. This hypothesis appears the more probable, when we reflect, that something of the same sort often happens in the roots of teeth long after the destruction of their crowns.

TREATMENT.

When a tooth, deprived of its vitality, is found to be productive of injury to the gums and to the adjacent teeth, it should be immediately removed; for, however important or valuable its presence may be, the health and durability of the others should not be jeopardized by its retention.

If a necrosis of one or more of these organs is apprehended, we should endeavour, by the application of leeches to the gums, and washing the mouth with suitable astringents, to prevent its occurrence. When this plan of treatment is adopted at an early period, it will generally prove successful; but, if it be long neglected, no favourable result can be anticipated from it.

CHAPTER SEVENTH.

OF EXOSTOSIS OF THE ROOTS OF THE TEETH.

THIS disease is common to all bones, but it never attacks any other part of the teeth than their roots, and it usually commences at their extremities, then extends upwards, covering a greater or less portion of their external surface. It sometimes, however, commenees upon the side of the root and forms a large tubercle, at other times the deposite of the new bony matter, is spread over its surfaee, often uniformly, but more frequently unequally. The osseous matter thus deposited, is generally harder than the root, and has a faint, yellowish, semi-transparent appearance.

FIG. 50.

Sometimes the enlargement is very great, and instances have occurred where two teeth have become united by it. The author has one specimen in which this has happened in his possession, presented to him by Drs. Blandin and Reynalds, of Columbia, South Carolina, and represented in the accompanying cut.



Exostosis often continues for a long time without producing any inconvenience whatever. It usually first manifests itself by a slight soreness in the affected tooth, which increases as the fang becomes enlarged, until pain, either constant or periodical, and of a character more or less severe, is expericenced.

The most remarkable case of dental exostosis on record, is related by Mr. Fox. The subject of it was a young lady, who, at the time she came to Mr. F. had suffered so much and long, that the palpebræ of one eye had been closed for near two months, and the secretion of saliva had, for some time, been so copious, that it flowed from her mouth, whenever opened. She had tried every remedy within the province of medicine, without experiencing any permanent benefit, and was finally relieved from her suffering, only by the extraction of every one of her teeth.

In the course of the author's practice, he has removed many teeth that were affected with exostosis, but has never met with a case similar to that narrated by Mr. F. In one instance, he was compelled to extract four sound teeth and nine roots; yet the pain was not, at any time, severe, yet it was constant, and a source of great annoyance to the patient. The history of a very singular case, which came under his observation, will be found in another part of this work.

CAUSES.

The primary cause of this disease does not appear to be well understood. But most writers concur in attributing the proximate cause to inflammation of the periosteum of the fang. And this inflammation is not, as some authors suppose, dependent upon any morbid condition of the crowns themselves; for it often attacks teeth that are perfectly sound. It seems rather to be attributable to some peculiar constitutional tendency.

TREATMENT.

The disease having established itself does not admit of cure, and when it has progressed so far as to be productive of pain and inconvenience to the patient, the loss of the affected teeth becomes inevitable. When the enlargement is very considerable and confined to the extremity of the root, and has not induced a corresponding enlargement of the alveolus around the neck of the tooth, the removal of the affected organ is often attended with difficulty, and can only be effected by removing a portion of the socket, or fracturing it.

CHAPTER EIGHTH.

SPINA VENTOSA.

AMONG the diseases which attack the teeth, Mr. Fox mentions spina ventosa, but I am of the opinion that the term is inapplicable to the affection he designates by it. In medical language, the term spina ventosa, is used to designate a disease peculiar to other bone consisting of an ulcerated tumor, caused by internal caries and attended by an enlargement exteriorly, and a prieking of the flesh.

The disease which Mr. Fox designates by the name of spina ventosa, he thus describes. "The seat of the malady is in the cavity of the tooth; the vessels ramifying on its membrane, acquire a diseased action, by which the membrane becomes thickened, absorption of some of the internal parts of the tooth takes place, and the opening, at the extremity of the fang, also becomes enlarged. This disease of the membrane is attended with the formation of matter, discharging itself at the point of the fang, into the alveolar cavity, which, being rendered more porous by the process of absorption, affords an easy exit. During the progress of the disease, the gum, covering the alveolar process, becomes inflamed, and acquires a spongy texture; the matter, passing from the socket, makes its escape into the mouth by several openings through the gum, which is thus kept in a constant state of disease."

Now, it will be perceived, that there is little or no analogy between spina ventosa and the disease spoken of by Mr. F. under that name. The latter is nothing more than the effects of alveolar abscess, produced by inflammation and suppuration of the lining membrane.

CAUSES.

The enlargement of the opening at the extremity of the fang, is not, as Mr. Fox believes, caused by the action of the absorbents. Before this takes place, the membrane that lines the canal of the root, has been destroyed, and the vital powers of the fang so much reduced, as to preclude the possibility, even admitting that the absorbents were capable of effecting such enlargement, of its being accomplished through their agency.

We can, therefore, attribute this enlargement only to the action of the confined matter, or rather to some corrosive property possessed by it. This explanation appears the more probable, when we consider that the matter, discharged from the socket, is ichorous, offensive, and of a corrosive character.

Moreover, spina ventosa is characterized by an enlargement of the bone on the outside, while, in the disease in question, there is no exterior enlargement. The external appearance of the crown and root is that of a necrosed tooth.

TREATMENT.

A tooth affected with this disease does not admit of cure. The proper treatment therefore, consists in the prompt removal of the tooth. There are no local nor general remedies that can be applied, that will afford relief. The symptoms perhaps, may sometimes be palliated, but it is not advisable to tamper with a tooth thus affected, as it will only serve to protract and ultimately to augment the evil.

CHAPTER NINTH.

OF THE DENUING OF THE TEETH.

THIS is one of the most remarkable affections to which the teeth are liable. It consists in a gradual wasting of the enamel on their labial surfaces. It usually first attacks the central incisors, and thence extends to the laterals, the cuspidati, bicuspidates, and, sometimes, even to the first and second molars. It generally forms a continuous horizontal groove, which is as regularly and smoothly constructed as if it had been made with a file. After it has removed the enamel, it commits its ravages upon the subjacent bone, and oftentimes penetrates nearly half way through its substance. The colour of the enamel is rarely ever changed by it; but the bone, as it becomes exposed, assumes a dark brown and highly polished appearance.

This affection sometimes commences at a single point, from which it proceeds in a horizontal direction, until it has extended to three or four and sometimes even to six or seven of the teeth on each side of the median line. At other times, it commences in several places which afterwards unite, and gives the enamel the appearance of having been scooped out with a broad round-pointed instrument.

CAUSES.

The cause of this singular affection has never been satisfactorily explained. It was first noticed by Mr. Hunter, who called it decay by denudation, and supposed, "from its attacking certain teeth rather than others, and from its being confined to a particular tooth," that it is a disease inherent in the tooth itself, and not dependent on circumstances in after life.

Mr. Bell thinks that Mr. H. has confounded this affection, with another similar in its appearance, but arising from a wholly different cause: he remarks:

“‘I have seen instances,’ says Hr. Hunter, ‘where it appeared as if the outer surface of the bony part, which is in contact with the inner surface of the enamel, had first been lost, so that the attraction of cohesion between the two had been destroyed; and, as if the enamel had been separated for want of support, for it is terminated all at once.’ In this passage, Mr. Hunter describes very accurately the result of superficial absorption of the bony structure, a circumstance which I have occasionally seen, though more rarely than the present abrasion of the enamel, with which it cannot, for a moment, be considered as identical. In one case, the enamel is gradually and slowly removed by a regular and uniform excavation; in the other, the abruptness and irregularity of the edges, show that it had broken away at once, from having lost its subjacent support. The cause of the former is external; in the latter, it is within the enamel.”

Mr. Bell, in attempting to correct one error, has fallen into another, equally as great and palpable. He attributes the breaking in of the enamel, to an absorption of the subjacent bone, instead of ascribing it to caries, the true cause.

In almost every instance, where I have found the edges of the enamel in the condition as described by Messrs. Hunter and Bell, I have also observed, that the surface of the exposed bone was decayed.

But the breaking in of the enamel, is not the affection now under consideration. That is the result of caries of the subjacent bone; this, that of spontaneous abrasion.

Mr. Bell is unfortunate also in the suggestions, which he throws out, in regard to the cause of this disease. “Whatever may be the cause,” says he, “and, at present, I confess myself at a loss to explain it, the horizontal direction in which it proceeds, may, I think, be connected with the manner in which the enamel is deposited during its formation: for it will be recollected, that it first covers the apex of the tooth, and gradually invests the crowns by *successive circular depositions*; it is, therefore, not improbable, that from some temporary cause, acting during its

deposition, certain circular portions may be more liable to mechanical abrasion, or other injury, than the rest."

This conjecture, though plausible, does not satisfy the mind of the inquirer. If, as he supposes, certain circular portions of the enamel are less perfectly formed than others, and, consequently rendered more liable to the disease, it would not be solely confined to the anterior surface of the tooth, but would extend entirely around it, and, as soon as these imperfectly formed circular portions were destroyed, its ravages would cease. Moreover, it not only attacks the enamel on the anterior surfaces of the teeth, but it also often destroys a considerable portion of the bone.

Mr. Fox frankly acknowledges his inability to assign any cause for this affection; but conjectures, that it is dependent on some solvent quality of the saliva. Were this supposition correct, every part of the tooth would be alike subject to its attacks.

Other writers suppose that it is occasioned by the friction of the lips. But this hypothesis is destitute of the least semblance of plausibility. The narrowness and depth of the groove are sometimes such, as to preclude the possibility of the contact of the lips with its interior surfaces. Some authors, again, believe it to be attributable to the use of tooth brushes; but these opinions are as ill founded as those of the others.

The bony structure of a tooth, after it is denuded of its enamel, is generally quite sensitive, and is very susceptible to the influence of heat and cold.

TREATMENT.

As a preventive, Mr. Fox recommends the avoidance of whatever tends to produce it, but unfortunately he leaves his readers entirely in the dark upon this subject. In advanced stages of the affection, the author has often succeeded in arresting its progress, by widening the groove at the bottom, and afterwards filling it with gold. This treatment, in the majority of cases, proves successful.

CHAPTER TENTH.

SPONTANEOUS ABRASION OF THE CUTTING EDGES OF THE FRONT TEETH.

FIG. 51.



THE spontaneous abrasion of the cutting edges of the front teeth, is an affection of very rare occurrence. It commences on the central in-

cisors, and from thence proceeds to the laterals, the cuspidati, and sometimes, though very rarely, to the first bicuspidates. Teeth that are affected by it, have, when the jaws are closed, a truncated appearance, do not come closely together, and are rather more than ordinarily susceptible to the action of acids and of heat and cold. In other respects, little or no inconvenience is experienced from it until the crowns of the affected teeth are nearly destroyed.

Its progress is exceedingly variable. It sometimes destroys half or two-thirds of the crowns of the central incisors in two or three years; at other times seven or eight years are required for the same effect to result from it. In one case which came under my own observation, the abrasion had extended to the bicuspidates; and the central incisors of both jaws were so much wasted, that, on closing the mouth they did not come together by nearly three-eighths of an inch; and but two years had elapsed since its commencement. In another case, where it had been going on for seven years, it had not extended to the cuspidati, and the space between the upper and lower incisors, did not ex-

FIG. 51.—Represents a case of spontaneous abrasion, taken from a drawing given by Mr. Bell.

eced an eighth of an inch. The subjects of both were gentlemen—the first aged about twenty-eight, that of the other twenty-one.

Mr. Bell gives an interesting case of a gentleman whose teeth were affected with this disease:—"About fourteen months since, 1831, this gentleman," says he, "perceived that the edges of the incisors, both above and below, had become slightly worn down, and, as it were, truncated, so that they could no longer be placed in contact with each other. This continued to increase and extend to the lateral incisors, and afterwards, successively, to the cuspidati and bicuspidates. There has been no pain, and only a trifling degree of uneasiness, on taking acids, or any very hot or cold fluids, into the mouth. When I first saw these teeth, they had exactly the appearance of having been most accurately filed down at the edges, and then perfectly and beautifully polished: and it has now extended so far, that when the mouth is closed, the anterior edges of the incisors of the upper and lower jaws are nearly a quarter of an inch asunder. The cavities of those of the upper jaw must have been exposed, but for a very curious and beautiful provision, by which they have become gradually filled by a deposit of new bony matter, perfectly solid and hard, but so transparent, that nothing, but examination by actual contact, could convince an observer that they were perfectly closed. This appearance is exceedingly remarkable, and exactly resembles the transparent layers which are seen in agatose pebbles, surrounded by a more opaque mass. The surface is uniform, even, and highly polished, and continuous, without the least break, from one tooth to another. It extends, at present, to the bicuspidates, is perfectly equal on both sides, and when the molares are closed, the opening, by this loss of substance in front, is observed to be widest in the centre, diminishing gradually and equally on both sides to the last bicuspidates."

Dr. J. D. McCabe, a dentist of Richmond, Virginia, described to me, in 1837, a case that he had seen a short time before, which was very similar to the one mentioned by Mr. B. He also gave me the name and age of the individual affected, and the length of time the abrasion had continued; but these, I do not recollect with sufficient accuracy to repeat.

CAUSES.

"On the cause of this very extraordinary occurrence," says Mr. Bell, "I confess myself wholly at a loss to offer even a conjecture. It cannot have been produced by the friction of mastication, for these teeth have never been in contact since the first commencement of the affection; nor does it arise from any apparent mechanical cause; for nothing is employed to clean the teeth, excepting a soft brush. Absorption will equally fail to account for it; for not only would this cause operate, as it always does, irregularly, but we find that, instead of these teeth being the subjects of absorption, a new deposition of bony matter is, in fact, going on, to fill the cavities which would otherwise be exposed."

Mr. Bell is correct in supposing that it is not the result either of mechanical action or absorption. If then, neither of these agencies are concerned in its production, it must be the result of some chemical action, though not of the salivary fluids of the mouth, for if it was, every part of the exterior surfaces of the teeth would be acted on alike. This, as well as the affection last noticed, I am disposed to believe, is produced by an acidulated condition of the mucus fluid of the mouth. The anterior surfaces of the upper front teeth not being so frequently washed by the saliva, the mucus secretions of the upper lip, are often permitted to remain on these portions of the teeth for a considerable length of time, and to the presence of this, when in an acidulated condition, I believe the denuding process to be attributable, while the abrasion of the cutting edges of the incisors and cuspidati is caused by acid mucus secreted by the mucus follicles of the end of the tongue, which is brought in contact with the cutting extremities of the front teeth almost constantly, and I believe that it is in this way that their loss of substance is effected.

TREATMENT.

This, like some of the other affections of the teeth that have been noticed, cannot be cured. If the tendency to an acidulated condition of the mucus secretions of the mouth could be overcome or counteracted, its progress, perhaps, might be arrested. But,

this is a branch of practice that comes rather within the province of the medical than the dental practitioner, so that any directions upon the subject here are unnecessary.

MECHANICAL ABRASION OF THE TEETH.

Were it true, as is asserted by Richerand, that the loss of the enamel occasioned by friction, is repaired by a new growth, it would never suffer any loss from mechanical abrasion; but, the assertion is not only untrue, but too absurd to need refutation.

The teeth are rarely abraded, when the upper front ones overlap, as they usually do, those of the lower. It is only when the cutting edges of these teeth strike upon each other, that a mechanical abrasion of their substance takes place; and, it is no unusual thing for their crowns to be entirely worn off, while those that are farther back in the mouth remain almost entire. The reason of this is, that when the upper and lower front teeth strike plumb upon each other, the lateral motions of the jaw not being restricted, the friction is greater in the anterior, than in the posterior parts of the mouth; consequently, the front teeth will suffer more from abrasion than the others.

Sometimes, the whole of the teeth are abraded alike; at other times, owing to the peculiar manner in which they come together, it is confined to only a few.

Mr. Bell believes that certain kinds of diet tend, more than others, to produce abrasion of the teeth. To establish his belief, he tells us that sailors, who, the greater portion of their lives, live on hard biscuits, have only a small part of the crowns of their teeth remaining above the edges of their gums. Certain sorts of diet may, it is true, influence abrasion, but I do not think it to be so much attributable to them, as to the circumstances just noticed.

When the front teeth of the lower jaw strike against the inside of those of the upper, the substance of the latter is sometimes worn more than three-fourths away, and in some instances, even entirely up to the gums. I have seen the teeth of some individuals so much abraded, in this way, that but little of their crowns remained, except the enamel on their anterior surfaces.

The wearing away of the crowns of the teeth would expose their lining membranes, were they not previously removed, and the cavities filled with ossific matter, by that singular process of the economy which has been so accurately described by Mr. Bell. But thus, an event, from which the most painful consequences might result, is so anticipated by a wise provision of nature, as to occasion but comparatively little inconvenience.

CHAPTER ELEVENTH.

FRACTURES AND OTHER INJURIES FROM MECHANICAL VIOLENCE.

THE injuries that the teeth receive from mechanical violence, are so various in their character, that it is impossible to give any thing more than a few general rules for their treatment. Owing to differences in the physical structure of the teeth, and in the constitutional temperaments of individuals, blows, of the same degree of violence, produce very dissimilar effects upon these organs. Thus, for example, a blow that would be sufficient to loosen a tooth, in the mouth of one person, might not be productive of any permanent injury; while a similar blow, in the mouth of another, might occasion the complete necrosis of one of the teeth.

A tooth that is of a compact texture, and in a healthy mouth, may be deprived of a portion of its substance without any serious injury; but a similar loss of substance from a tooth, not so dense in its structure, and situated in a mouth whose secretions were vitiated, would be very likely to produce a rapid decay. Hence, in order to accurately prognosticate the results of injuries of this sort, we must take into consideration, not only the character of the teeth upon which a blow has been inflicted, but also the health of the mouth and of the individual in which it is situated.

If the tooth is not loosened in its socket, any injury that might result from the loss of a small portion of its enamel, or even of the bone, may be prevented by smoothing the fractured surface with a file, so that the juices of the mouth, and particles of extraneous matter, may not be retained in contact with it. But if the tooth is loosened, and inflammation of the investing membrane supervene, leeches should be applied to the gums, and the mouth washed several times a day, with some astringent lotion, until the inflammation shall have subsided.

When a tooth, by a blow, has been displaced from its socket, and its vascular connection with the general system broken up, necrosis is always the result. An imperfect union between it and the alveolus, may sometimes be effected, but it will soon assume a sickly appearance, the gums will become dark, and an unhealthy action, in most cases, be induced in the contiguous parts. A tooth thus circumstanced, unless it be an incisor or cuspidatus, should never be permitted to remain in the mouth.

I have, on several occasions, replaced teeth that had been knocked from their sockets; but in only one instance was the operation attended with any thing like success. A healthy boy, of about thirteen years of age, while playing bandy, received a blow from the club of one of his playmates, which knocked the left central incisor of the upper jaw entirely out of its socket. I saw the boy about fifteen minutes after the accident. The alveolus was filled with coagulated blood. This I sponged out, and, after having bathed the tooth in tepid water, carefully and accurately replaced it in its socket, and secured it there by silk ligatures attached to the adjacent teeth. On the following day, the gums around the tooth were considerably inflamed; to reduce which, I directed the application of three leeches, and a frequent use of diluted tinct. myrrh, as a wash for the mouth. At the expiration of four weeks, the tooth became firmly fixed in its socket, but from the effusion of coagulable lymph, the alveolar membrane was thickened, and the tooth, in consequence, somewhat protruded. A slight soreness, on taking cold, has ever since been experienced.

Dr. E. Noyes, an eminent dentist of this city, mentioned to me a case somewhat similar in its character. The subject of it was a boy of about ten years of age. One of his front teeth, by a fall, was forced from its socket. On its being replaced shortly after, it, in a few weeks, became again firm in its alveolus. Mr. Bell also mentions a similar case, attended with a like result.

The alveolar processes and jaw-bones are often much injured by mechanical violence. About eleven years ago, I was requested by the late Dr. Baker, of Baltimore, to visit, with him, a lady who, by the upsetting of a stage between Washington and that city, had her face severely bruised and lacerated. All that portion of

the lower jaw, which contained the six anterior teeth, was splintered off, and only retained in the mouth by the gums and integuments, with which it was connected. The wounds of her face, having been properly dressed, the detached portion of the jaw was carefully adjusted and secured by a ligature passed round the front teeth and first molares, and by a bandage on the outside, passed round the chin and back part of the head. Her mouth was washed, five or six times a day, with diluted tinct. myrrh. The third day after the accident, by the direction of Dr. B., she lost twelve ounces of blood; and, in about five or six weeks, with no other treatment than the dressing of the wounds, she perfectly recovered.

It often happens, that the crown of a tooth is broken off down to the fang. I have known persons to have four and even nine of the crowns of their teeth thus fractured. The crowns, fangs, and alveolar processes, are sometimes ground to pieces, or the teeth driven into the very substance of the jaw-bone. Mr. Bell says that he once found a central incisor so completely forced into the bone, that he thought it to be the remains of a fang, but, on removing it, found it to be an entire tooth.

When the crown of a tooth has been broken off by a blow, the root should be immediately extracted, because the injury that it has received will not permit it to remain with impunity in its socket. I have sometimes engrafted artificial crowns on such roots, but the practice is, in general, a bad one. When it is desirable that the loss should be repaired by the substitution of an artificial tooth, the root should be extracted, and time allowed for the alveolus to become removed and the gums to be restored to health before replacing it.

CHAPTER TWELFTH.

FUNGIOUS GROWTH OF THE PULPS.

WHEN the lining membrane of a tooth becomes exposed, fungous granulations are frequently thrown out, which sometimes are very rapid in their growth, and almost as sensitive as the pulp itself. They, however, usually partake more of the character of the gums, though, on being wounded, they bleed more profusely.

The curative indication, in cases of this kind, are so palpable, that no one can hesitate as to what course to pursue. Temporary relief, may, it is true, be afforded by excising the excrescence, but it will soon return. The only sure remedy, is the extraction of the tooth.

PART FOURTH.

SALIVARY CALCULUS.

DISEASES OF THE GUMS AND ALVEOLAR PROCESSES, AND
THEIR TREATMENT.

EFFECTS OF MERCURY, TOBACCO AND SNUFF UPON THE
TEETH AND GUMS:

AND OF

DISEASED TEETH AND GUMS ON THE GENERAL HEALTH.

PART FOURTH.

CHAPTER FIRST.

OF TARTAR, OR SALIVARY CALCULUS.

THE physical characteristics, and local and constitutional tendencies of the caleareous substance under consideration, having been noticed in a preceding place, it will not be necessary to refer to them again. I shall therefore confine my remarks chiefly to its elementary constituents—its origin—the manner of its formation—its effects, and the manner of removing it from the teeth.

ITS COMPOSITION.

Tartar or salivary calculus is composed of phosphate of lime and animal matter, combined in various proportions, according as it is hard or soft, consequently no two analyses will yield the same result. The following is the analysis made by Mr. Peps for Mr. Fox. Fifty parts yielded,

Phosphate of lime,	35
Fibrina, or cartilage,	9
Animal fat, or oil,	3
Loss,	3
	<hr/>
	50
	<hr/>

Berzelius gives the following analysis. He found one hundred parts to contain

Phosphate of lime and Magnesia, . . .	79.0
Salivary Mucus and Salivine, . . .	13.5
Animal Matter,	7.5
	<hr/>
	100.
	<hr/>

Mr. Dwinelle, a scientific and ingenious dentist of Cazinova, New York, furnishes the following:

"Of one hundred parts, there are," says he, of

Phosphate of lime,	60.
Carbonate of lime,	14.
Animal Matter and Mucus,	16.
Water and Loss,	10.
	<hr/>
	100.
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The last named gentleman acknowledges that he could make no two analyses agree. Hard, dry tartar, contains more earthy and less animal matter than the soft and humid.

The infusoria of which M. Mandl says tartar is composed, have their origin from the vitiated mucus that is always mixed with it. They are more or less numerous, as the tartar is hard or soft, or in proportion to the quantity of mucus that enters into its composition. Mr. Dwinelle has given a minute description of their appearance, in the 1st No. of the 5th volume of the American Journal of Dental Science.

OF ITS ORIGIN AND THE MANNER OF ITS FORMATION.

There are a variety of opinions with regard to the source from whence this substance originates. English and American writers on the subject, agree in ascribing its production to the saliva, but the French differ with regard to its origin. Jourdain, thinks it is secreted by glands, which he believes are scattered over the periosteum of the teeth. Gariot, says it comes from the gums.

Serres, tells us he has discovered upon the mucus membrane of the gums certain glands, whose particular function it is to secrete this substance. And in commenting upon the views of this last mentioned author, M. Delabarre, thus remarks: "The small glands, which he thus designates," (alluding to the appellation of dental which the author gives to them,) "may perhaps belong to the mucous or salivary system, for the saliva, as all physiologists know, is not alone furnished by the parotid glands, but by a great number of calculus kennels, that are very observable in ruminating animals, scattered over various parts of the mucus membrane of the mouth. I, therefore, am of opinion, that this is a gratuitous supposition on the part of this author, because children of a very early age are not affected with tartar, and it is on them that he believes he has discovered the glands which produce it. Did these really exist, they would augment in size, instead of decreasing, as age advanced, and their functions becoming more and more established, they would attain to a very large size in old persons, and those most subject to tartar. Now, there is nothing to lead us to suppose their existence in these individuals. Therefore, to suppose that organs that have no functions may be very perceptible, which, when they have them, cannot be discovered, is contrary to sound philosophy; were we to do so in this case, the *dental glands* of the author, would be entirely different from all others, which are the more decided, the more they are in action. Inadmissible then, as this supposition is, I do not believe in the existence of these glands, which I have patiently searched for, but in vain."

My own views in relation to the supposed existence of the dental glands of M. Serres, are so fully expressed in the foregoing remarks of M. Delabarre, that I do not deem it necessary to say more upon the subject, except to add what has been suggested by others, that he has evidently mistaken the mucous follicles of the mucus membrane of the gums for glands.

But, M. Delabarre is not more fortunate in the theory which he advances of the manner of the formation of salivary calculus, than Serres. He ascribes the production of this substance to a diseased exhalation of the mucus membrane of the mouth. Alluding to what M. Dupuy, professor of the veterinary establishment at Alfort,

says concerning the formation of tubercular matter, of a calcareous nature, in soft tissues, where he supposes there is no other fluid but mucous, he tells us that it is "in the same manner that the exhalents of the gums furnish tartar," and that "they give out more or less of it according as the gums are in a healthy or inflamed state." When diseased, he says, "they are covered with a whitish layer, which is at first soft," but gradually collecting upon the teeth, it afterwards becomes hard; and according to this author, it is only when the gums are inflamed that it is produced.

It is in this way that he accounts for its accumulation on the teeth of one side of the mouth, while those of the other have none of it on them, though they are all bathed alike in the saliva. The concretions of these terreous salts in the salivary conduits, he accounts for, by supposing them to be furnished by the exhalents of the mucus membrane which lines them, and not by the fluid they convey to the mouth.

Analogous formations in other parts, he accounts for in the same way. The calculus incrustations that are found, upon a sound, that has remained in the bladder for a long time, on its removal, and from subjects, in whom no previous disposition to gravel had existed, he supposes to be the result of the irritation produced by the instrument, on the mucus membrane of this viscus. In replying to this part of his argument in support of his theory that salivary calculus is furnished by the exhalents of the mucus membrane of the mouth, Mr. Bell, says, "The previous non-existence of calculus in the bladder cannot be deemed any proof that the elements of its composition had not been held in solution in the urine, requiring only the occurrence of any extraneous body in the bladder to serve as a nucleus for its deposition. This view of the subject is amply confirmed by the fact, that depositions, both of the lithic salts and of the triple phosphate, the bases of the usual varieties of urinary calculi, are constantly formed from the urine after its expulsion from the bladder."

It is unfortunate for M. Delabarre, that he drew this analogy, for Mr. Bell has shown it to be conclusive against the theory which he intended to establish by it, "and," says this author, "that salivary calculus, or tartar of the mouth, is deposited in a similar

manner from the saliva, is, I think, directly proved, or at least, supported by the highest degree of probability by every circumstance connected with its formation." The fact too, that it is always found in largest quantity on the teeth opposite the mouths of the salivary ducts, is a strong argument of itself, in favour of the theory that it is a salivary production; but, still more conclusive, is the fact of its formation within the very channels themselves of these conduits.

The theory of M. Delabarre is insufficient for the explanation of its deposition here, for, it is not at all presumable, that an inflammation would seize upon a single point of the mucus membrane of one of these passages, without affecting it to a considerable extent. The most probable cause of its formation in these conduits, therefore, appears to me, to be the accidental precipitation of a particle of it from the saliva on its passage through them, which, becoming entangled in the mucus, is detained, and afterwards serves as a nucleus for its deposition.

Of the existence of the elements of its composition in the saliva there can be no question. Chemical analyses of this fluid, direct from the glands that secrete it, place all doubt upon the subject at rest. It may also exist in solution in the mucous fluids, but that it does, we are not so well assured.

The circumstance that the deposition of this substance on the teeth is always accompanied by inflammation of the gums, M. Delabarre seems to rely upon as conclusive in favour of the correctness of his views of the manner of its formation. But here again, he is equally unfortunate. The inflammation of which he speaks, is the effect, and not the cause, as he supposes, of its deposition. The soft white layer of tartar, of which he makes mention, as observable on the gums, when diseased, is nothing more than thick, hardened mucus. I have repeatedly examined it, and am therefore, well assured of the correctness of the assertion.

The deposition of tartar on the teeth of one side of the mouth, without a similar deposit on the corresponding teeth of the opposite side, does not furnish the least shadow of evidence in support of the doctrine that this substance is an exhalation from the sanguineous capillaries of the mucus membrane of the gums. The

mastication of food, with most persons, is principally performed by the teeth on one side of the mouth, and, with the fact that this function prevents, in a considerable degree, the accumulation of tartar on the organs immediately concerned, every dental practitioner must be conversant. Hence, its frequent collection on those of one side, and not on those of the other. And, that it is ascribable to this, is susceptible of positive proof. If, on the removal of the tartar from the teeth of a person, in whose mouth it had only collected on those of one side, mastication be afterwards altogether performed on these, it will not re-accumulate on them, and if the requisite attention to the cleanliness of the other side be not properly observed, it will soon collect on them, although they had before remained free from it. I have frequently requested my patients to do this, and such has almost invariably been the result, which would not have been the case, were its formation dependent on inflammation of the gums.

Again, it often happens that disease of a severe character, is excited in the gums, by the use of mercurials and other causes, and yet, but a small quantity of tartar collects on the teeth; but, that any condition of the general system, or of the mouth, tending to increase the viscosity of the fluids of this cavity, promotes its formation, is undeniable. There are, however, some temperaments much more favourable to its production than others, and, it is a fact, equally well established, that the mucus membrane of those, in whose mouths it accumulates in largest quantity, are the most irritable, and their buccal fluids most viscid.

From all the light, therefore, that has been thrown upon this subject, the conclusion, that this earthy matter is a salivary production, to me, appears irresistible, and, the following seems to be the manner of its formation.

It is precipitated from the saliva, as this fluid enters the mouth, on the surfaces of the teeth, opposite the openings into the ducts, from which it is poured. To these, its particles become agglutinated by a mucus, that is always found, in greater or less quantity, upon them. Particle after particle is afterwards deposited, until it sometimes accumulates in such quantities that nearly all the organs are almost entirely enveloped in it. It is always, however, found in greatest abundance on the outer surfaces of the superior

molars, and the inner surfaces of the inferior incisors, and it is opposite to these that the mouths of the salivary ducts open.

ITS EFFECTS UPON THE TEETH, GUMS AND ALVEOLAR PROCESSES.

The results of the presence of this substance upon the teeth are always pernicious, though sometimes more so than at others. An altered condition of the fluids of the mouth, diseased gums, and not unfrequently the gradual destruction of the alveolar processes, and the loosening and loss of the teeth, are among the consequences that result from it. But besides these, other effects are sometimes produced by it, among which may be enumerated: tumors, and spongy excrescences of the gums of various kinds; necrosis and exfoliation of the alveolar processes, and portions of the maxillary bones, hemorrhages of the gums, anorexia and derangement of the whole digestive apparatus; foul breath, catarrh, cough, diarrhœa, diseases of various kinds in the maxillary antrum and nose, pain in the ear, headache, melancholy, hypochondriasis, &c. The character of the effects, however, both local and constitutional, produced by it, depends upon the quantity and consistence of the tartar, and the temperament and state of the general health; and the two former of these, are determined by the two latter, and the attention that is paid to the cleanliness of the teeth. If this last be properly attended to, salivary calculus, no matter how great the constitutional tendency to its production may be, will not collect upon the teeth. The importance, therefore, of its constant observance, cannot be too strongly impressed upon the mind, and especially of those in whom there exists a great tendency to its deposition.

The teeth and their contiguous parts, suffer more from accumulations of this substance, than almost any other cause. Caries is not much more destructive to them.

When it is permitted to accumulate for any great length of time, the gums become so morbidly sensitive, that a tooth-brush cannot be used, without producing great pain: consequently, the cleanliness of the mouth is not attempted, and thus, no means being taken to prevent its formation, it accumulates with in-

creased rapidity, until the teeth, one after another, and in quick succession, fall victims to its desolating ravages.

It sometimes not only undermines the soundest constitutions, by occasioning discharges of fetid matter from the gums, and corrupting the juices of the mouth, but also renders the breath exceedingly unpleasant and offensive.

MANNER OF REMOVING IT.

This is an operation of inestimable value to the health of the gums, alveolar processes and teeth. But, from a misconception of its nature, rather than from a fear of its pain, many are much opposed to it; and, notwithstanding the universal admiration excited by clean and white teeth, suffer the beauty of these organs to be destroyed, rather than submit to its performance. There are some, indeed, who, though scrupulously particular in every thing that regards dress, seem, nevertheless, to consider the cleanliness of their mouths as unworthy their notice.

For the removal of tartar from the teeth, a variety of instruments are necessary, which should be so constructed, that they may easily be applied to all of the teeth to which this substance adheres. Those that are put up in small boxes and sold in the shops, are illy suited for the purpose. Those used by experienced practitioners, are so very similar in their shape, and so well known, that I do not deem it necessary to point out the minute differences of their construction, or even to give a general description of the instruments themselves.

Every dentist should have a sufficient number and variety to enable him to perform the operation in the most perfect manner, and with the least possible inconvenience to the patient. For, if any particles of tartar be suffered to remain, they will irritate the gums, and serve as nuclei for immediate subsequent re-accumulations.

The gums not unfrequently bleed very freely during the operation: consequently, it is better to remove the tartar from the lower teeth first, else the blood will prove a source of annoyance to the operator. When the lower front teeth have become loosened, he must proceed with much caution, and, in order to

prevent the teeth from being jarred, or started from their sockets, he should steady them with the thumb or fore-finger of his left hand.

The adhesion of tartar to the teeth is sometimes so strong, that considerable force is required for its removal, even when the sharpest and best tempered instruments are employed. But ordinarily, not much is requisite, if properly applied. Considerable tact, however, is always necessary to perform the operation in a skilful manner; more than most persons, from its simplicity, imagine. This skill can be acquired only by practice. Tartar may be taken from the outer and inner surfaces of the teeth without much difficulty, but the removing of it from between them, is more troublesome, and can only be effected by means of very thin, sharp pointed instruments.

When this substance has greatly accumulated, it should not all be taken away at one time. It should be removed first from between the edges of the gums and the roots of the teeth. Thus an opportunity will be afforded, between the respective sittings of the patient, for the gums to heal, and for any of the teeth, that are loosened, to become firm. It would also be advisable to wash the mouth, four or five times a day, with some astringent or detergent lotion, such as dilut. tinct. myrrh and nut galls. More particular directions on this subject will be given, when we come to treat of the diseases of the gums and alveolar processes.

There is a means, that is frequently resorted to for the removal of tartar, which I cannot suffer to pass unnoticed: I allude to the employment of solvents. Their use, it is true, has been deprecated by almost every writer on dentistry; but yet it is still continued, and that too even by some very respectable practitioners. Those that are most employed for this purpose, are such of the mineral acids as are supposed to possess the least affinity for the elementary principles of the enamel. The muriatic acid is probably oftener used than any of the others.

The advocates of this practice suppose, that certain mineral acids, in consequence of the want of affinity that exists between them and the phosphate of lime, a principal constituent of the enamel, may be used upon the teeth with perfect impunity. But,

330 MANNER OF REMOVING TARTAR FROM THE TEETH.

were it not true that they act upon the teeth as solvents, they would not dissolve the tartar, which, in its composition, is very similar to the enamel. Any chemical agent that will decompose the one, will decompose the other also, and the use of all such should be carefully avoided.

When the gums have been restored to health by the removal of the tartar, and by other means, hereafter to be considered, its future re-accumulation may be prevented by a regular and constant use of a suitable brush.

CHAPTER SECOND.

DISEASES OF THE GUMS.

THE gums and alveolar processes, from apparently the same cause, frequently assume various morbid conditions. An unhealthy action in one, is almost certain to be followed by disease in the other. The most common form of disease, to which these parts are subject, is usually, though very improperly, denominated scurvy, from its supposed resemblance to *scorbutus*, "a genus of disease in the class *cachexiæ*, and order *impetiginis*, of Cullen." To this disease, however, it bears no resemblance. Instead, therefore, of continuing the use of this term, I propose to treat of it under the appellation of *inflammation and sponginess of the gums, accompanied by recession of their margins from the teeth, and the destruction of the alveolar processes*, which seems to me to express more clearly the condition of the parts, and the nature of the affection. The other affections to which the gums and alveoli are liable, will be noticed under appropriate heads.

The diseases of the gums and alveolar processes, are divided by Mr. Bell, into two classes; "those which are the result of local irritation, and those which arise from constitutional causes."

But were it not for local irritation, the constitutional tendencies to disease, in these parts, would rarely manifest themselves; and, on the other hand, were it not for constitutional tendencies, the effects of local irritation would seldom be of a serious character. "Thus," says Mr. B. "the same cause of irritation, which, in a healthy person, would occasion only simple abscess, might, in a different constitution, result in ulceration of a decidedly cancerous type; and in others, in the production of fungoid tumors, or the formation of scrofulous abscesses."

It is a well established axiom in pathology, that each disposition has its own peculiar tendencies, and that these tendencies are increased by an augmentation, from whatever cause produced, of the general irritability of the system. Thus, in a person of a mucous disposition, a derangement of the digestive organs aggravates the habit, and increases the tendencies superinduced by it, to certain forms of disease in particular organs, and in none more than the gums. For example—a local irritant that would cause in an individual of this disposition, and not affected with any appreciable general derangement, nothing more than a slight congestion in the margins and apices of the gums between the teeth, would occasion in another of the same disposition, if affected with dyspepsia, turgidity and sponginess of their substance for a considerable distance around.

Enfeeblement of the vital powers of the body, increases the susceptibility of the gums to the action of irritating agents. Hence, they are often affected with inflammation, sponginess and suppuration of their edges, in persons labouring under excessive grief, melancholy, or any other affection of the mind, tending to enervate the physical energies of the organization. Disease, therefore, in these organs, is always favoured by general debility, and the reason of its being more aggravated in some than others, is owing to the differences in the attention that is paid by different individuals to the cleanliness of the teeth, and the differences in the tendencies that exist in them to it. In dispositions unfavourable to diseased action in the mucus membranes, and where constant and regular attention to the cleanliness of the teeth is observed, the only notable effects resulting to the gums from debility, is a diminution of their colour.

A local disease, situated in a remote part, often has the effect of diminishing the tendency in the gums to be morbidly excited, but when from its violence or long continuance, the general health becomes implicated, the susceptibility of these parts is augmented.

Although deriving the predisposition which they have to disease, from a specific, morbid, constitutional tendency, they nevertheless, when diseased, contribute in no small degree to derange the whole organism. An unhealthy action here vitiates

the fluids of the mouth, and renders them unfit for the purposes for which they are designed,—hence, when these parts are restored to health, whether by the loss of the teeth, or the prescription of the dental surgeon, improvement immediately takes place in its condition.

Not only is a healthy condition of the gums essential to the general health, but it is likewise essential to the healthy condition of the teeth and their retention in their sockets. From the intimate and direct relationship that subsists between them, disease cannot exist in one, without, in some degree, at least, affecting the others. Caries of the teeth for example, gives rise to inflammation of the gums, and the alveolo-dental periosteum. On the other hand, inflammation in these parts is always, sooner or later, followed by a gradual destruction of their substance, and that of the alveolar processes, the loosening, and frequently the falling out of the teeth,—a morbid condition of the juices of the mouth, from which, decay of the teeth, when the organs are not sufficiently dense to enable them to resist their corrosive action, and an impairment of the vital powers of the body, is almost certain to result.

INFLAMMATION AND SPONGINESS OF THE GUMS—ACCOMPANIED BY RECESSION OF THEIR MARGINS FROM THE TEETH, AND THE DESTRUCTION OF THE ALVEOLAR PROCESSES.

The gums, when affected with this disease, are turgid and spongy, have a dark florid or purple appearance, their edges are thick and round, and on being pressed, discharge matter, varying from healthy pus to that of the most fetid kind. They are sometimes slightly painful, usually very sensitive, and bleed from the most trifling injury.

The disease generally makes its appearance round the lower front teeth and the upper molares, opposite the mouths of the salivary ducts, and in the immediate vicinity of aching, decayed, dead, loose, or irregularly arranged teeth, or in the neighbourhood of roots of teeth, and from thence it extends to the other teeth. The rapidity of its progress is dependent on the age,

health, and constitutional temperament of the individual, and the local irritants that excite and keep up its action. In some cases, it exists for years, without occasioning any perceptible recession of the gums, or destruction of the alveolar processes;—the only unpleasant consequences attending it, being a vitiated state of the secretions of the mouth, and an offensive breath. In other instances, it progresses so rapidly, that, in a few weeks or months, both the gums and alveoli become involved in complicated disease.

When inflammation in the gums is favoured by a constitutional tendency, it soon extends to the alveolar and dental periosteum, and causes a deposition of bony matter at the bottom of the socket. The edges of the gums and alveolar processes are, at the same time, gradually absorbed, so that, finally, the teeth, by the destruction of the parts that contain them, are loosened and drop out.

Nor do the pernicious effects of this disease always stop here. Constitutional symptoms often supervene, more vital organs become implicated, and the health of the general system is sometimes very seriously impaired. Hence, the constitutional improvement that is often observed after the loss of the teeth of those persons, whose mouths were previously affected with this disease. At the conclusion of the present part of this work, I shall speak more particularly of the effects of diseased teeth and gums on the general health, and show the importance of mastication and of the mixture of pure saliva with the food during this process. It will therefore, only be necessary to observe here, that no condition of the mouth has a greater tendency to deteriorate its secretions, and impair the function of mastication, than the one now under consideration.

In forming an opinion of its character, and the consequences that are likely to result from it, the practitioner should be governed, not only by the health and age of the patient, and the local causes concerned in its production, but he should also endeavour to ascertain, whether it is connected with a constitutional tendency, or is purely a local disease. To determine these points, will often require much pathological knowledge, because

its causes are frequently involved in considerable obscurity. Hence, some have been led to believe, that the wasting of the gums and alveolar processes, may sometimes take place without being connected with any special local or constitutional causes; that it is identical with that process by which the teeth of aged persons are removed, and that when it occurs in persons not past the meridian of life, it is symptomatic of a sort of premature old age.

Mr. Bell, on this subject, remarks: "In forming a judgment upon cases of this description, however, and even on those, in which the loss of substance is associated with more or less of diseased action, it is necessary to recollect, that the teeth are generally removed in old age by this identical mode, namely, the destruction of their support, by the absorption of the gums and alveolar processes; and as this step towards general decay commences at very different periods in different constitutions, it may doubtless, in many cases, even in persons not past the middle period of life, be considered as an indication of a sort of premature old age, or an anticipation, at least, of senile decay, as far as regards these parts of the body."

Though the loss of the teeth, by the wasting of the gums and alveolar processes, is almost always an attendant on advanced age, I do not believe it to be a necessary consequence of senility, for we occasionally see persons of seventy, and even eighty years of age, whose teeth are as firmly fixed in their sockets, and their gums as little impaired, as they were at twenty. I do not recollect ever to have seen a case of this sort, in which there was not evidently some diseased action in the parts. But it is of but little importance whether it be the result of old age, a constitutional tendency, functional derangement of some other part, or of local irritation.

CAUSES.

I am of the opinion, that the disease would never manifest itself, no matter how great the constitutional tendency to it, were it not for local irritation. This belief seems to be justified by every circumstance connected with the early stages of the disease.

It is not necessary that there should be aching, decayed, dead, or irregularly arranged teeth, or tartar, to irritate the gums and alveolar membrane. The arrangement of the teeth is often such, even when regular, that inflammation is produced in certain parts of the mouth, which, sooner or later, according to the particular constitutional temperament, results in disease. Hence it is, that in mouths where all the teeth are sound, we occasionally see a gradual wasting of such parts of the gums as are most prominent, especially those which surround the cuspidati and the palatine fangs of the upper molar teeth.

The secretions of the mouth, especially the mucus, are often rendered, by certain conditions of the general system, so acrid, as to become a source of great irritation to the gums. And it may be that all the teeth, as their vital powers are weakened by age, are, to a certain extent, rendered obnoxious to the more highly organized and sensitive parts within which their roots are contained.

Thus, it will be seen, that local agents may exert a considerable influence in the production of this disease, without their being easily detected. It should also be recollected, that a person of sixty, seventy, or even eighty years of age, is exposed to the same, and perhaps more powerful local causes of it, than one of twenty, and that the reason their effects are not always developed in earlier life, is, that there are greater tendencies to this disease in the constitutions of some than in those of others.

Dr. Koecker, a practitioner, who has had the most ample opportunities of observing this affection in all its various forms, says, he has never seen a case of it in which tartar was not present.

This disease attacks persons of all ages, ranks, and conditions, and in every country, climate, and nation. "I have observed," says Dr. Koecker, "the inhabitants of the most opposite countries, the Russians, the French, the Italians, the Spaniards, the Portuguese, the English, the Africans, the East and West Indians, and those of the United States, to be all more or less liable to it."

It is, however, more frequently met with in the lower than in

the higher classes of society. Persons who pay no attention to the cleanliness and health of their teeth, are particularly subject to it. With sailors, and those who live principally on salt provisions, it is very prevalent. "Persons of robust constitutions," says the author just quoted, "are much more liable to this affection of the gums, than those of delicate habits; and it shows itself in its worst forms, oftener after the age of thirty than at any earlier period."

Every thing that tends to produce inflammation in the gums and alveolar processes, may be regarded as exciting causes of this disease. To those that have already been enumerated, may be added, accumulations of extraneous matter on the teeth, and along the edges of the gums, exostosis of the roots of the teeth, artificial teeth badly inserted, or of improper materials, and dental operations injudiciously performed. The use of tooth-brushes wrongly constructed, and improper tooth powders, especially charcoal, are usually reckoned among its exciting causes. Acids of all sorts, we are told by Dr. Fitch, produce "irritability of the gums about the necks of the teeth."

Every condition of the general system that tends to increase the susceptibility of the gums to the action of local irritants, favours the production of the disease; and every thing that tends to induce such conditions, may be regarded as its predisposing causes; such as bilious and inflammatory fevers, the excessive use of mercurial medicines, venereal poison, and intemperance and debauchery. Any deterioration of the fluids of the body is peculiarly conducive to it. Persons of cachectic dispositions are far more subject to it, and generally in its worst forms, than those in whom no such tendency exists.

Persons of strumous habits, sometimes have an affection, which, though it may be thought to resemble somewhat the one just described, yet it differs from it in many respects. The gums, instead of being purple and swollen, are paler and harder than ordinary, and, on being pressed, discharge a muco-purulent matter, of a dingy white colour. They often remain in this condition for years, without appearing to suffer any loss of substance, or to affect the alveolar processes.

This variety of disease of the gums, is principally confined to

persons that have very white teeth, is much less likely to attack males than females; and has never, so far as I have been able to ascertain, been mentioned by any dental writer. Mr. Fox speaks of ulceration of the gums of scrofulous children; but that is of frequent occurrence, and is characterized by the usual signs of inflammation. This rarely occurs before the age of eighteen or twenty; and, though unquestionably the result of inflammation, yet the gums exhibit no inflammatory symptoms; but, on the contrary, are paler, less sensible, and possessed of less warmth than usual. It is never attended with tumefaction of the gums, and by absorption only in its advanced stages; whereas, the affection of which Mr. Fox speaks, is always accompanied by both.

Its effects are the most simple and innocent of any form of disease to which the gums are liable; but its cure is generally the most difficult.

TREATMENT.

Inflammation and sponginess of the gums are generally regarded by dentists as being capable of cure, and so far as regards their restoration to health, they most assuredly are; but when they have lost their connection with the teeth, a re-union can never be established.

The gums, after having been once affected in this manner, are more liable to be attacked again, because the necks of the teeth, having become exposed, present a surface more favourable to the collection of tartar, and more irritating to the edges of the gums than the crowns of these organs.

The treatment of spongy and inflamed gums, in order to be successful, must be thorough. No temporizing, half-way measures will answer. If an energetic and properly conducted plan be pursued, a favourable result may always be anticipated.

Local irritation being the cause of the affection, its curative indications are obvious. All dead and loose teeth should be extracted, salivary calculus and every other sort of offensive, irritating matter, should be taken away; "all such teeth," says Dr. Koecker, "as from their irregular situation or direction, excite a mechanical irritation, provided this irregularity cannot be remedied by filing, or by cutting away the irritating parts, should also be removed."

Irregularity of the teeth is so productive of irritation to the gums and alveolar membrane, that the gums are seldom healthy, whenever it is at all considerable; but, instead of first attempting to remedy the evil, in the manner recommended by Dr. Koecker, the cause should first be removed, by extracting one or two teeth, provided their removal will not injure the appearance of the denture.* The irritation occasioned by the pressure of the incisors, may, in young persons, generally be allayed by the extraction of a bicuspid on each side of the mouth; but the propriety of the operation can never be ascertained, except by a judicious examination of each individual case. "A molar tooth, that has no antagonist, should not," says Dr. Koecker, "be permitted to remain, particularly if it be situated in the upper jaw." This opinion is certainly in accordance with the indications of nature; for when a tooth has been deprived of its antagonist, it generally soon becomes protruded by the filling up of the bottom of its socket with bony matter; the gum around it, usually, soon inflames, and it is more sensitive than the other teeth.

"In this manner," says the author just quoted, "the loss of one molar tooth, produces the destruction of its remaining antagonist. This is effected, however, after a struggle of nature, of very long duration, which will always involve, in some degree, all the other teeth in a like diseased condition; it is necessary, therefore, to prevent this morbid condition, particularly pernicious in this disease, by the extraction of the tooth, or any molar so situated."

Although a molar tooth, after having lost its antagonist, is generally productive of bad consequences, it may sometimes be allowed to remain with impunity. Its removal is necessary only when it acts as an irritant to the gums.

To the cure of this disease, it is essential that a decided impression should be made upon it at once; consequently no time should be lost in the removal of its exciting causes. If there be any teeth which act as irritants, and cannot be restored to health, they should be removed at one sitting. The advantage derived, in this disease, from this operation, says a distinguished practitioner, (Dr. Koecker,) would be either partly or wholly lost, were

* Vide *Method of Directing Second Dentition*, in a preceding part of this work.

it performed at different periods. This observation has been verified by me more than once. When I have been prevented by the timidity of my patient from extracting all the offending teeth, at the first sitting, I have always found the cure much retarded, and in some instances, almost entirely defeated.

This operation having been completed, Dr. Koecker thinks that it is better to wait ten or fifteen days, before the tartar is removed. But Dr. Fitch, while he is of the opinion, that "extraction should precede all other operations, he believes, that in some cases, all may be performed the same day." The operations of extraction and cleansing, should, for reasons before stated, be performed with as little delay as possible; but it is of no great consequence which be performed first; though, on some accounts, it is desirable, that so much of the tartar as can, should be removed at one and the first sitting. Several sittings, however, as has been before remarked, are often requisite for its complete removal.

The bleeding from the gums and sockets, occasioned by these several operations, should be promoted by frequently washing the mouth with warm water; and when the gums are much swollen, they should be, from time to time, freely scarified with a sharp lancet. This operation is highly recommended by Messrs. Hunter, Fox, and Bell, and indeed its good effects are so apparent, that it should never be neglected. The application of leeches to the gums, is also attended with the most decided advantage. For the last four or five years, I have been accustomed, in obstinate cases, to recommend their employment, and the decided advantage that generally follows their use, is sometimes truly astonishing.

After the gums have begun to recover, the cure will be much accelerated, by washing the mouth several times a day, with some tonic and astringent lotion. The following I have found to be very serviceable:

℞ Pul. nut galls, ʒ ij.
Orris root, ʒ i.
Cort. cinchonæ, ʒ ij.
Infus. rosæ, ʒ iv. *Misce.*

Mr. Fox says, that great benefit is derived from the use of sea water, "and therefore," says he, "I always recommend it whenever it can be procured;" adding, that if the gums be tender, it should be used warm. I am unable to speak of the merits of this remedy from experience; but I should suppose, that no decided advantage could result from it. I have, in cases where there was much soreness and ulceration of the gums, prescribed the following:

℞ Sub. boras. soda, ʒ ij.
Decoct. sage, ʒ vj.
Honey, ʒ i. *Misce.*

As a wash for the mouth, Dr. Fitch recommends a decoction of the inner bark of green white oak, which I have, in several cases, prescribed, and always found to be beneficial. The following are recommended by Dr. Koecker, as being very serviceable:

"Take of clarified honey, three ounces, and of vinegar, one ounce. This, diluted in the proportion of three table spoonsful to a pint of warm sage tea, or water, may be used frequently during the day.

"Take of clarified honey, and of the tincture of bark, two ounces each. Mix and dilute as above.

"Take of honey, and of the tincture of myrrh, two ounces each. Mix and use as above.

"Take of honey, and of the tincture of rhatania, two ounces each. Mix and dilute as above.

"Take of honey, and of the tincture of catechu, one ounce each. Mix and dilute as above."

Dr. Koecker directs that the mouth, after the extraction of the teeth, should be frequently washed for several days, with one of the foregoing preparations. Mr. Bell recommends the following:

℞ Aluminæ, ʒ ij.
Decoct. cinchonæ.
Infus. rosæ ā ʒ ij. *Misce.* Fiat lotis.

If, notwithstanding the use of the means which we have here

recommended, matter still be discharged from around the necks of the teeth, and the gums continue spongy, and manifest no disposition to heal, their edges should be touched with a solution of the *nitratum argentum*, which will seldom fail to impart to them a healthy action. It may be used in the proportion of one or one and a half grains to one ounce of water. The most convenient mode of applying it, is with a camel's-hair pencil. Its use is recommended by Mr. Fox, and will often succeed, when all other remedies fail. In those cases where the matter discharged from the edges of the gums has a nauseating and disagreeable odor, "a weak solution," says he, "is an excellent remedy for rendering the mouth sweet and comfortable;" but in using it in this way, precaution is necessary to prevent its getting in the fauces, as, in that case, it will cause a disagreeable nausea.

While the means here directed for the cure of this disease are being employed, a recurrence of its exciting causes must be studiously guarded against. Tartar and foreign matter of every kind, should be prevented from accumulating on the teeth, by a free and frequent use of a suitable brush and waxed floss silk, which, until a healthy action be imparted to the gums, should be used at least five times a day; as, for example, immediately after rising in the morning, after each meal, and before retiring at night. The application of the brush may at first occasion some pain; but its use, should nevertheless, be persisted in; for, without it, all the other remedies will be of but little avail. The friction produced by it, besides keeping the teeth clean, is of great service to the gums, as it imparts to them a healthy action.

Treatment different from that here described, is necessary for the form of disease, which we noticed, as being characterized by a preternatural paleness of the gums, and by a discharge of muco-purulent matter, from between their edges and the necks of the teeth. In the first case of this disease that I treated, I directed astringent and detergent lotions to be used; but these did not produce the desired effect. Having been led from my observations in this case, to believe that the disease was connected with the constitutional health, and probably the result of

a debilitated state of the general system, I recommended in the next case in which I was consulted, the use of tonics and free exercise in the open air. This course, though attended with an evident improvement in the general health, seemed to be productive of no benefit to the gums. They still appeared debilitated, and, on being pressed, discharged matter from beneath their edges. I advised a continuance of the tonics and exercise, and with a view of exciting inflammation, touched the edges of the gums with *nitratum argentum*. This had the desired effect, and, as I had anticipated, a new disease was substituted for the old one; for the cure of which, I directed the mouth to be washed, five or six times a day, with sage tea, slightly impregnated with alum, and sweetened with honey; and every night and morning, with warm salt water; which, as soon as the tenderness of the gums subsided, was used cold.

This treatment was perfectly successful. In about three weeks the gums assumed a healthy action, acquired their natural colour, and the discharge of muco-purulent matter entirely ceased. I have since had occasion to treat several other cases of the same disease, in all of which I adopted a similar practice, and with a like success.

CHAPTER THIRD.

OF A PRETERNATURAL PRURIENT GROWTH OF THE GUMS.

THOUGH this disease, in very many respects, resembles the preceding, yet it has many peculiarities, which are worthy of separate consideration. It is characterized by swelling and inflammation of the gums; but instead of causing them to retire from the necks of the teeth, it occasions a morbid growth of their substance; so, that in some instances, the crowns of the teeth are entirely covered, and mastication rendered exceedingly difficult and painful. The gums, when affected with this disease, as when affected with the other, are of a dark purple colour, with thick, smooth, rounded edges, and discharge a very fetid matter. They hang loosely around the teeth, and are attended with a peculiar itching sensation, which, at times, is very annoying; they are also so very sensitive, that even the pressure of the lips produces pain. Their vessels are turgid, and often bleed profusely from the slightest touch.

The breath of a person thus affected, is exceedingly offensive, the saliva is vitiated and so viscid, that it is even difficult to spit. The secretions of the mouth generally, are so acrid, that gold, even twenty carats fine, is readily corroded by them.

CAUSES.

This peculiar affection, though excited into action by local irritants, appears nevertheless to be dependent on a cachectic tendency of the general system. How far it may be influenced by local causes, I am unable to determine. It often attacks the gums of individuals, whose teeth are perfectly sound, and regular in their arrangement; but I have never seen a case of it, where

tartar was not present, though, in some instances, the quantity was so small, that I doubted whether it could have had any agency in the production of the disease. A diseased action, however, may have been first excited in the gums, by its presence, which, afterwards, having been favoured by a constitutional predisposition, may have continued until it induced this peculiar morbid condition.

TREATMENT.

The first thing to be attended to in the treatment of this disease, is the removal of all dead and such other teeth, as may, in any way, irritate the gums. The affected part of the gums should be next removed, by making a horizontal incision entirely through to the crowns of the teeth. This should be carried as far as the morbid growth itself extends, even if that includes the whole alveolar circle. After this operation has been performed, the gums should be freely scarified, by passing a lancet between all the teeth entirely down to the alveoli, in order that the vessels may discharge their accumulated blood. This should be repeated several times, and at intervals of four or five days. Meanwhile the mouth should be washed several times a day, with some astringent and detergent lotion; and occasionally with a weak solution of *nitratum argenti*. The tartar also should be removed, as soon as the gums have sufficiently collapsed.

During the employment of these local means, the constitutional health should not be neglected; but such remedies prescribed, as are best calculated to counteract and break down every tendency to the disease. Particular attention must be paid to regimen, and excesses and intemperance of every kind, prohibited. Suitable exercise, and vegetable diet, should be prescribed. If any animal food be used, it should be fresh, and consist principally of beef, mutton, and fowls. Vegetables, especially fruits, and acid beverages, such as spruce beer, lime juice, and infusions of malt and vinegar, are recommended, because they are supposed to restore to the fluids, the healthy qualities of which they have been deprived.

I have met with several cases of this description of diseased gums, which, when treated as here recommended, were uniformly restored to health; so that I do not hesitate to say, that most of the failures, which occur in the treatment of this, as well as every other sort of spongy and inflamed gums, is attributable to inefficient treatment.

CHAPTER FOURTH.

SPONTANEOUS ULCERATION OF THE GUMS OF CHILDREN, AND EXFOLIATION OF THE ALVEOLAR PROCESSES.

THE gums and alveolar processes of children are occasionally attacked by a very peculiar and most singular form of disease—one, which I think, has never been noticed either by English or American medical writers, but which has nevertheless been very accurately described by several French authors,—and particularly by Delabarre, whose opportunities for observing it in every variety of form, seem to have been ample. This affection is peculiar to children, and occurs more frequently during the shedding of the temporary and the dentition of the permanent teeth than any other periods of childhood. Adults, I have never known to be affected with it, and to the ordinary spongy, inflamed and ulcerated gums, it does not appear to be at all analogous.

Among the symptoms which characterize the disease in question, are, itching, ulceration and separation of the gums from the necks of the teeth and alveolar processes, discharging at first a mucopurulent, but ultimately an ichorous and fetid matter. The teeth loosen; and the alveoli lose their vitality and exfoliate. Ulcers are formed in various parts of the mouth, the gums and lips assume a deep red or purple colour. In the exfoliation of the alveolar processes, the temporary, and sometimes the crowns of the permanent teeth, are carried away. The skin, for the most part, is dry; the pulse small and quick, the bowels generally constipated, though sometimes there is diarrhœa, and to these may be added lassitude and a disposition to sleep.

These may be regarded as the most prominent symptoms of the disease in its most aggravated form. When exfoliation of the alveolar processes takes place, they usually abate, and

sometimes wholly disappear. Delabarre says, "among the great number of children that are brought to the orphan asylum, he has had frequent occasion to notice singular complications of the affection," which are modified according to the strength, "sex, and idiosyncrasies of the different subjects." The gums and lips, in some, he describes as being of a beautiful red colour; in others the lips as rosy and the gums pale, and as being sometimes much swollen. He also enumerates among the symptoms, burning pain in the mucus membrane of the cheeks, ulceration, and pain and swelling in the sub-maxillary glands.

In the majority of the cases the disease is confined to one jaw and to one side, though sometimes both are affected by it. The effects on the permanent teeth, in all the cases which have fallen under the notice of the author, were always injurious, though Delabarre says, if children reach the seventh or eighth year, they are not injured, except that it causes them to be badly arranged, in consequence of the want of a proper development of the jaw.

The author from whom I have just quoted enumerates among the symptoms of the most aggravated form of the disease, inordinate appetite, burning thirst, a small spot on the cheek, or about the lips, resembling an anthrax, which rapidly increases in size, turns black, separates, discharges an ichorous fluid, and its edges "roll themselves up like flesh exposed to the action of a brisk fire." The flesh separates from the face; the bones become exposed, hectic fever ensues, and in the course of fifteen or twenty days, death puts an end to the sufferings of the child. We are also informed by Delabarre, that this affection is more common among females than males, and that the bones of the jaws is so much softened that they may be easily cut with a knife.

CAUSES.

The disease seems to be the result of general debility or defective nutrition and a cachectic habit of body. It never occurs among the wealthy, but is always confined to children of the poor and destitute, and so far as the author's observations extend, to those who reside in cellars or small and confined apartments. Children of scorbutic habits too, seem to be the most subject to

it. Delabarre, however, informs us that he has met with it in children who appear robust and in other respects well. He says its "seat is in the organs of nutrition, and in the fluids that are conveyed to them." The bad disposition which gives rise to it, he mentions as being sometimes innate, and sometimes the result of suffering from want of proper nourishment. He does not regard it as resulting from "a distinct disturbance of any organ, separately considered."

From the great debility of all the organs of the body, their functions are languidly and but imperfectly performed. That the disease is determined by general enfeeblement of the functions of the body, there is, I think, little doubt, but whether or not it would develop itself independently of any local cause, is a question which I do not feel myself able satisfactorily to answer. It is not at all improbable, however, that local irritants are the exciting cause, and I am the more inclined to this belief from the fact, that in all the cases which have fallen under my observation, the teeth were considerably decayed, and had previously given rise to pain, and in some, were coated with tartar. While, therefore, the character of the affection is determined by some peculiar constitutional tendency and general enfeeblement of the vital powers of the body, it is not unlikely, that local irritation is the immediate cause of its development.

TREATMENT.

The treatment of this affection comes more immediately within the province of the medical than the dental practitioner. I shall not therefore, dwell long upon this part of the subject.

The local treatment should consist of acidulated and astringent gargles, and a solution of the chloride of lime or soda. The ulcerated parts should be occasionally touched with a strong solution of the nitrate of silver, and Delabarre says, he has, in some cases, derived great advantage from touching them with the actual cautery. As soon as the alveolar processes exfoliate, they should be removed. After this takes place, a cure, with suitable constitutional treatment, is generally speedily effected. This last should consist of mild alteratives, a generous nutritive diet, con-

sisting of succulent viands; and in the absence of fever, tonics, and exercise in the open air.

The author just quoted, with a view to arouse the vitality, says, he has "successfully employed the *juice of cruciferous plants, the guinea in powders*," but with the last he unites opium, in order to diminish the action of the digestive apparatus. Counter irritants, such as blisters, he employs when it is necessary to displace irritation of some interior organ.

CHAPTER FIFTH.

TUMORS AND EXCRESCENCES OF THE GUMS AND ALVEOLAR PROCESSES.

FROM the gums and alveolar processes, tumors and excrescences, of various kinds, occasionally arise, which vary in their character, from a mere simple growth of the gums, to those of a fungoid, cartilaginous, bony and scirrhus nature. I shall leave it to the general surgeon, to treat minutely of the many varieties which this description of disease occasionally presents, and shall content myself with a few remarks on some of its peculiarities, and the causes most frequently concerned in its production.

Tumors and excrescences of these parts, are very variable in their character and appearance. The surface of some is smooth; that of others rough, and sometimes covered with eroding ulcers: some are bulbous, and have a broad base; others are attached to the gums by a mere peduncle: some are soft; others are hard: the growth of some is astonishingly rapid; that of others is so slow as to be scarcely perceptible: some are almost entirely destitute of blood vessels; others appear to be almost wholly composed of sanquiferous capillaries: some are nearly destitute of sensibility; others are so exquisitely sensitive, that the slightest touch produces great pain; and hence have been named, *noli me tangere*: some are nearly white; others have a grayish appearance: some retain the colour of the natural gum; others are of a dark purple hue. Finally, some exist for years, without being attended with any serious consequences; while others, in a very short time, bring on general constitutional derangement.

CAUSES.

Tumors of the gums seldom arise spontaneously, but are, in most instances, the result of local irritation, occasioned by the presence of tartar, decayed, or dead teeth, and roots. Their character is doubtless determined by the degree of excitability that exists in the gums, and by the constitutional tendency of the general system. Hence their great variety. Different effects are often produced by the same causes; and a cause that would, in a person of a healthy and sound constitution, produce a tumor or excrescence of the most simple kind, might, in another, labouring under some unhealthy excitement, or of a strumous, cachectic, or some other peculiar habit, occasion a tumor of a fungoid, cartilaginous, bony, or scirrhus character.

It is probable, that these tumors sometimes appear independent of any local cause; yet I think that their origin is more frequently local than is generally supposed; and that, if all the circumstances connected with the history of each case, especially the previous condition of the teeth, could be accurately ascertained, their cause might, in most instances, be traced to irritation of the gums, or alveolar membranes, produced by some unhealthy or crowded state of these organs, or to salivary calculus.

Mr. Liston, in his practical surgery, remarks: "Very many of the *tumors of the jaws*, are traceable to faulty growth or position of the teeth, to diseases of their bodies, or to improperly conducted operations upon them." And, in speaking of tumors of the gums, he observes: "They are caused by decay of some part of one or more teeth, of the crown, neck, fang, or they may arise from their being crowded or misplaced." The pressure of the teeth on certain parts of the gums, and membranes of the alveoli, which irregularity necessarily occasions, keeps up a constant irritation; and it thus as frequently gives rise to these tumors, as does the presence of tartar or decay.

I do not, however, conceive it necessary to the production of these tumors, that any of the causes here enumerated should exist at the time they make their appearance. The gums and alveoli,

having been once affected, are ever afterwards more susceptible to morbid impressions. It is, therefore, quite probable that an unhealthy action, is sometimes continued in them, long after the cause that produced it ceases to exist; and that this, from being favoured by a subsequent unhealthy action of some other part, or of the system generally, occasions and determines their location in those parts. When we consider how often and almost constantly the gums and alveolar periosteum, are exposed to irritation, from the causes just mentioned, we cannot fail to admit, that the hypothesis is, at least, supported by a high degree of probability. No one, I think, will pretend to deny, that the maxilla and gums, suffer more from local irritation, than any of the other parts of the body; and to this irritation, I am firmly persuaded most of their diseases are to be ascribed.

TREATMENT.

Of these productions, the most common is, that which in its structure, resembles the gums, except that it is usually rather more vascular. This description of tumor is always occasioned by carious teeth, or the roots of those that have decayed; and on their removal generally spontaneously disappear. But if this should not be the case, they should be excised. To this, however, I have rarely had occasion to resort.

About nine years ago, I was called on, by a gentleman who had a considerable enlargement of the gums, that had followed an attempt to extract the first superior molaris of the left side, in which the two outer fangs had been fractured from the crown, and left in their sockets. For fifteen or twenty days after the operation, he informed me he had experienced considerable pain, but that at the expiration of this period, it had entirely subsided. About two months after, however, it was again experienced, although the roots were entirely covered by the gums, which were much inflamed, and soon began to assume a bulbous form, and gradually to increase in size, until the tumor had, at the time I saw him, twelve months after the operation, attained the size of a black walnut.

The tumor being situated over the remaining roots of the tooth,

I advised him to have it removed, and the roots extracted. But although he readily agreed to the removal of the roots, he could not be induced to consent to the excision of the tumor. In extracting the roots, however, it was necessary to cut away about a third of its base; and in six or eight days after, all the remainder sloughed off, and the gums soon assumed a healthy appearance.

Mr. Fox relates a case of a lady who had an enlargement of the gums, that almost entirely filled up one side of her mouth. She first applied to Sir Astley Cooper, who sent her to Mr. Fox, to have several decayed roots, that were around the tumor, extracted, before he should attempt its extirpation. The fangs being imbedded in the gums, the excrescence was much lacerated in their removal, afterwards it became placid, assumed a dark colour, and in a short time sloughed off. Thus a perfect cure was effected without any other operation, than that of the extraction of the decayed roots.*

This tumor, it would seem, partook somewhat of a fungoid character, and those of this description are generally much more difficult to cure, than those which consist of a mere simple growth of the gums, like the one first noticed. Although they sometimes thus spontaneously disappear, on the removal of the causes that produced them, yet in most cases, extirpation becomes necessary, and even this, when not performed in the most perfect manner, is not always effectual. After the removal of one, another, has sometimes been known to spring up in its place; and thus several have sometimes appeared in immediate succession.

Mr. Hunter attributes the disposition of a tissue to re-produce excrescences of this kind, to a scirrhus tendency of the parts from which they originate. However that may be, a tumor will rarely re-appear, if the diseased structure be completely removed.

Mr. Fox recommends that excrescences of this sort should be extirpated by means of a ligature, and informs us that when they are thus removed a second operation is seldom necessary. Excision is often attended with a profuse and obstinate hemorrhage, and on this account, the operation recommended by Mr. F. should

* Diseases of the Gums, p. 84.

always be preferred, whenever its performance is practicable. The basis of some tumors, are, however, so broad, that a ligature cannot be applied sufficiently low, to include their whole structure. In such cases we must resort to excision, and if the hemorrhage cannot be stopped by compresses, the actual cautery should be employed.

Mr. Hunter, in treating of morbid growths, of soft parts, observes: "Arteries going to increased parts are themselves increased and have not the contractile power of a sound artery;" hence, when wounded, they bleed more freely than those that are in a healthy state.

The removal of excrescences of the gums by means of a ligature, not being attended with so much hemorrhage, and also usually exterminating them more effectually than excision, determined Mr. Fox in his choice of this mode of extirpation. In treating of this subject, he remarks: "I determined some years since, that if any case of this kind should ever come under my care, I would attempt their removal by means of ligatures. The first case in which I was consulted, was a lady of about forty years of age, who had several of the teeth on the right side of the upper jaw extracted when she was a young woman; about five years before I saw her, the gums covering the jaw where the teeth had been situated, appeared to be thicker than before; they gradually increased in size until a very large tumor was formed; it had now become so large as to affect the speech, and in other respects was extremely troublesome.

"The lady was very desirous to have it removed; to effect which without incurring the danger of hemorrhage, I employed ligatures, close to the jaw-bone, through the substance of the tumor, half of which was then included in each ligature. The ligatures were tied just tight enough to stop the circulation; the next day there was a great deal of inflammation, which subsided in proportion as the ligature began to produce ulceration, which on the fourth day was very considerable; new ligatures were then applied; on the sixth day these were removed and others introduced; on the eighth, one ligature came away, leaving the

tumor hanging only by a small peduncle; this being cut through with a lancet the whole was removed.”*

Even if the base be large, the plan above detailed by Mr. Fox, of passing a needle, armed with a double ligature, through it close to the bone, will, in most instances, insure success. The ligatures should be tied sufficiently tight to cut off the circulation between the tumor and the general system, and should be re-applied as often as they come away, until the tumor be entirely sloughed off, when the place should be touched with diluted nitrous acid or with a solution of *argentum nitratum*.

Cartilaginous excrescences of the gums and alveolar processes are comparatively of rare occurrence, but when they do happen, they are much more difficult to remove than fungous tumors, or those which consist merely of a preternatural growth of the gums. The hardness of their substance is such, that, in many cases, their removal by ligatures, is impracticable, and their extirpation with the knife, is also sometimes exceedingly difficult and tedious. The same objections apply to their removal by means of the knife as exist to that of fungoid tumors, for, though their substance is of a cartilaginous nature, they at the same time, partake more or less of a fungoid character. The knife, however, is in many cases, the only means by which their extirpation can be effected.

Ambrose Parè, with no small self-gratulation, talks of having removed them, when they were so large that they came out of the mouth, giving a most hideous appearance to the face, and when no other surgeon dared to undertake their cure, because of the lividity of their colour. “This lividity,” says he, “I did not fear, but I had the boldness to cut and even to cauterize the tumors until the disease was entirely cured.”†

Jourdain in speaking of cartilaginous excrescences, remarks: “About thirty-six years ago, I was called with Allertius Barin-gue, surgeon, to see a woman that had a tumor of a large size situated on the gum of the molar teeth. It occasioned her mouth to be drawn to the opposite side of her face when she was

* Fox on the Teeth, part ii, pp. 85, 86.

† Liv. viii. chap. 1 v. p. 188.

seized with spasms. We advised her not to delay too long in having it removed; to this she would not consent, but in a short time finding that the excrescences increased so fast, and in such a manner, that it hindered her from taking food, she changed her mind. The tumor was embraced with a brass wire, which we tightened every day. The excrescence, receiving nothing now to augment its growth, fell, and upon examination, we found that it was altogether cartilaginous.”*

Dr. Fitch quotes a case from Luzitanus, in which the operation for the removal of the tumor was followed by a fatal hemorrhage. The tumor is described as being about half the size of a hen's egg, exhaling a fetid odor, and being very painful. He also mentions a case of a somewhat similar character that came under his own observation. “The tumor occupied the space of the four incisor teeth of the upper jaw. The teeth were all carious. I extracted them. The tumor had four fistulous openings which ran in the direction of each tooth, and which furnished to each a fetid humor. With the actual cautery well heated in fire and double edged, I made but one wound of the four fistulous openings; I touched the bone that was carious, which was repeated several times in the space of three months. In proportion as the exfoliations were made, the tumor diminished. The patient was cured near the end of the fourth month.”†

When the base of the tumor is very broad and the bone beneath carious, as in the case described by Dr. Fitch, the actual cautery is without doubt the surest remedy: because it is obvious that until the diseased bone is exfoliated a cure can never be effected. But under no other circumstances would I recommend it to be used.

In April, 1832, at the instance of a medical practitioner, I was requested to visit a lady of about thirty years of age, who was the subject of a cartilaginous tumor, situated on the left side of the lower jaw, on the outer and superior edge of the bone, and between the second bicuspid and dentes sapientiæ; the first and second molares having been extracted three years before. The

* Jourdain, vol. 2, p. 334.

† Fitch's Dental Surgery, p. 237.

tumor was about three-quarters of an inch in length, and its shape somewhat resembled a ground-nut. I excised it, but with much difficulty, owing to its extreme hardness. In a short time, the wound granulated and healed, except a small portion of it on the upper and outer surface of the bone nearly over the place that the second molaris had filled. The gums here soon began to be prominent, which led me to fear a re-production of the tumor. To prevent this, I applied caustic, but without any beneficial result. Suspecting that the tooth might have been fractured in the operation for its extraction and a root left in the socket, I laid the gums open down to the bone. My conjectures were then verified. I found about two-thirds of one of the fangs of the second molaris remaining; I removed it immediately, and the wound healed in twelve or fifteen days, without occasioning any farther inconvenience.

This tumor had never caused much pain. It was covered with an apparently healthy integument, but internally it was hard and cartilaginous. The hemorrhage, occasioned by the operation, was considerable, but was easily suppressed.

Tumors that originate in the alveolar processes or periosteum, are generally of an osteo-sarcomatous, or cartilaginous character. The following is the only case of the kind that has ever come under my own personal observation. The subject of it was a gentleman of between thirty-five and forty years of age. It was about the size of a partridge-egg, and attached to the outer wall of the alveolus of the second superior right molaris, by a base not larger than a five cent piece. On the back part of the tumor, there was a small fistulous opening, from which an ichorous and fetid humor was discharged. The second molaris was much decayed, and on its being removed, two of its fangs were found slightly enlarged by exostosis. Having made a circular incision around the tumor, extending to the bone, I attempted to remove it with a knife, but was prevented from doing so by its great hardness. The character of the excrescence was now ascertained. I accordingly cut through the alveolar wall on each side of it, and then, by means of excising forceps, removed it, together with the alveolar paries to which it was attached.

On examination, it was found to consist of cartilage, interspersed with small patches of bone.

Mr. Bell has given two cases of a very similar character. One of them, however, he says, had no connection with the alveolar processes, and the other succeeded to an attack of the tooth-ache, which had lasted several months.

A case of an osteo-sarcomatous tumor, occasioned by diseased teeth, is recorded by Bordenave. Sir Astley Cooper gives the history of two cases of a like nature. In one of them the tumor originated in the alveolar cavities, and as it increased, displaced the teeth; the other case, he informs us, was produced by diseased teeth. Dr. Gibson, also mentions a case of an osteo-sarcomatous tumor, which, "according to the patient's account, first appeared seven months before," (the time he first saw her,) "in the form of a small lump, seated in the gum above the canine tooth."

In the treatment of tumors originating from the gums, or alveolar processes, or from both, much depends on their character, and the constitutional symptoms accompanying them. Some may be entirely removed, as we before stated, by simply extracting a decayed tooth or root; others will require extirpation, and in some instances even that will not avail. In short, the treatment should be varied to suit the respective circumstances of the case.

It sometimes happens, when an operation has been performed successfully, so far as regards the local disease, that the lungs, or some other vital organ, become affected. To prevent an occurrence of this kind, it is often necessary to get up, by means of a seton, an artificial excitement in some neighbouring part. Without some such precaution, the life of the patient might often be put in as great danger as that from which it has escaped by the removal of the local disease.

On the extirpation of fungous exostosis or osteo-sarcoma, Sir Astley Cooper observes: "The operation, after constitutional means have been employed, and the continuance of these means after the operation, hold out the chief hope of safety; for ampu-

tation without these, will do no more than avert the blow for a season."

The same remarks will be found applicable to the treatment of this description of disease, in whatever part of the body it may be situated. The constitutional symptoms should never be disregarded.

CHAPTER SIXTH.

OF ALVEOLAR ABSCESS.

THIS disease has usually been designated by the appellation of gum-bile—a name that by no means conveys a correct idea of its character; for by it, the gums are, as Mr. Bell remarks, “only secondarily affected,” while the cause “is invariably seated within the alveolus.” Hence he adopts the more appropriate appellation of *alveolar abscess*.

This is one of the most common affections to which the alveolar cavities are liable, and its effects are exceedingly pernicious, not only to the socket, in which it has originated, and the gums covering it, but also, often to the general health.

In its first or forming stage, the disease is attended with a deep-seated, throbbing and painful sensation, which is, sometimes, almost excruciating, and continues, with only occasional slight intermissions, until suppuration takes place, when it, in a great degree, subsides, and is succeeded by slight paroxysms of heat and cold.

The first effect produced by inflammation of the periosteum of the root, or of that of the alveolar cavity, is an effusion of coagulable lymph, which soon becomes hardened, and attaches itself to the root, around its apex. In this manner a sac is formed, which, as suppuration continues, distends and presses against the walls of the surrounding alveolus, and causes them to be destroyed, until an opening is made through the socket and gums for the escape of the matter.

This is the route which the matter most frequently takes in its escape, but sometimes an opening is made through the roof of the mouth, the cheek or face, through which it escapes: at other times it traverses the jaw for a considerable distance, divesting

it of its periosteum and causing necrosis and exfoliation; and, it not unfrequently happens that it is discharged into the maxillary sinus.

The formation of an abscess in the alveolus of a *dens sapientiæ* of the lower jaw, is not unfrequently accompanied by inflammation and swelling of the tonsil glands, so as almost entirely to prevent deglutition. The inflammation sometimes extends to the muscles of the cheeks and eyes, causing them to become so rigid as to prevent the mouth from being opened.

CAUSES.

The immediate cause of alveolar abscess, is inflammation of the lining or investing membrane of the tooth, and whatever tends to produce this, may be regarded as its exciting cause. It often happens, that the plugging of a tooth that has lost its lining membrane, gives rise to the formation of abscess, by preventing the escape of the matter that forms about the apex of its root; and its egress being thus cut off, it accumulates, and becomes a source of irritation to the investing membrane in the immediate vicinity, which thickens, forms a tubercle, and ultimately suppurates. The roots of teeth, too, on which artificial crowns are placed, for the same reason, often give rise to this disease.

TREATMENT.

After an abscess has formed, it rarely happens that the integrity of the parts is so perfectly restored, as to prevent a recurrence of the disease. Although the opening through the socket and gums closes, and the formation of matter ceases, yet the tooth, being deprived of vitality, is a continual source of an irritation to the alveolus and its contiguous parts, which, as has been before shown, will, sooner or later, eventuate in its loss.

The effects of alveolar abscess being such as have been described, every possible means should be employed to prevent the occurrence of the disease; for, after it has formed, it can be cured only by the removal of the tooth that has given rise to it. The treatment, therefore, should be preventive, rather than curative; for the latter to be effectual, calls for the loss of the organ, and

which, if sound, is of value. When, therefore, from the appearance of the symptoms just described, there is reason to apprehend an abscess, leeches, and such other remedies as have been recommended for odontalgia, produced by inflammation of the lining and investing membranes of the tooth, should be promptly employed.

Should these means have been neglected, or should they fail of success, the aching tooth should at once be extracted. Many, however, object to this practice, supposing that it is dangerous to extract a tooth, when the gums around it are inflamed and swollen. But a tooth may be removed with as much impunity, at such a time, as at any other. The operation, it is true, is then more painful, but not so much so as need deter any one from having it performed. When the tooth occupying the affected alveolus, is extracted, the sac formed by the disease, generally comes away with it, and thus the formation of an opening for the escape of the confined matter is at once prevented.

But there are circumstances that occasionally present themselves, which render the performance of this operation impracticable, or inadvisable; as for example, certain states of the constitutional health, and the fears or timidity of the patient. In such cases, the escape of the matter through the cheek or face, should be carefully guarded against, by applying suitable fermentations to the gums. As soon as the tumor upon the gums becomes soft, indicating the presence of matter, it should be punctured with a lancet, or with a sharp, bistoury-pointed knife.

The application of fomentations and emollient poultices to the face, is, perhaps, under hardly any circumstances, advisable; unless, when the disease is seated in the alveolus of a front tooth, where there is no danger of an external opening; and even then, I do not know that they are productive of any advantage. When the disease is seated in the socket of a molar tooth, external fomentations, tend, in a greater or less degree, to promote the passage of the matter through the cheek.

When an opening of this kind has formed, it is apt to become fistulous, especially if the tooth occupying the affected alveolus is not extracted. Examples of this sort are not unfrequent, and, during their continuance, are a source of much annoyance and inconvenience to the patient; and even when the discharge has

ceased, and the opening healed, there generally remains a deep sear, which continues through life.

Mr. Bell mentions some very singular effects, occasioned by an abscess in the alveolus of an inferior *dens sapientiæ*. Two years before he met with the case, an external fistulous opening had been formed; through which matter was continually discharged. "At this time," says he, "a funnel-shaped depression existed in the skin, which could be seen to the depth of nearly three-quarters of an inch, and a small probe could be passed through it into the sac of the abscess, underneath the root of the tooth. The abscess had now remained open for two years, during the latter of which, the parts had been in the state I have described. I removed the tooth, and, as I anticipated, no farther secretion of pus took place; but so perfectly had the communication been established, that, when the gum healed, it left by its contraction a fistulous opening, through which a portion of any fluid received into the mouth, passed readily to the outside of the cheek; and I could, with care, introduce a fine probe completely through the passage. So free in fact was the communication, that some of the hairs of the whiskers, with which the external portion of the depression was filled, grew through the internal opening, and appeared in the mouth.

"I passed a very fine knife, resembling the couching needle, through it, and removed as perfectly as possible, a circular portion of the parietus of the tube towards the gum; but failed in this, and several other attempts to produce a union. It was therefore resolved that the whole parietus of the depression should be removed, extending the incision as far internally as possible; and the integuments thus brought together as a simple wound. In consequence, however, of the suppuration of a small gland in the immediate neighbourhood, the operation was deferred until that should have been dispersed, and it, therefore, remains at present, in the state which I have described it."

It is scarcely ever necessary, however, in cases of this sort, to resort to any other means than those required for the cure of the abscess; for when that is effected, the external opening usually closes of itself. But should this not happen, the practice pursued by Mr. Bell in the case just quoted, ought to be adopted.

The irritation produced by an abscess in the alveolus of a *dens sapientiæ* is greater than that produced by one in the socket of any other tooth. Its effects are sometimes of an alarming character. The following is a case of this sort:

Thirteen years ago, a physician, Dr. E. residing thirty miles in the country, sent a request for me to visit him immediately. It was nine o'clock, P. M. when I received the message, and on the following morning, having rode nearly the whole of the night, I reached his residence. On my arrival, I was informed that he had been attacked two weeks before with a severe pain in the left *dens sapientiæ* of the lower jaw. After three or four days of much suffering, he called in a neighbouring physician, who, after several efforts, pronounced its extraction impracticable.

The inflammation then rapidly extended to the surrounding gums, fauces, tonsil glands, and to the muscles of the jaws and face. To these symptoms, high and intractable fever, and obstructed deglutition soon supervened. Fomentations to the face, free and repeated phlebotomy, and cathartics, had been employed, for the purpose of subduing the inflammation, but without effect, and the muscles of his jaws soon became so rigid and firmly contracted, that his mouth could not be opened. His breathing also, was difficult.

Such was the situation in which I found him. As it was impossible to introduce an instrument into his mouth, to remove the tooth that had given rise to these distressing symptoms, it was thought advisable to continue the practice that had been previously pursued, and also to administer an enema with two grains of tartarized antimony. About seven o'clock in the evening of the day on which I arrived, the fever was succeeded by alternate paroxysms of cold and heat, thus indicating that suppuration had commenced somewhere, and, from the obstruction of deglutition, it was supposed to be in the throat.

An effort was now made to pry open his mouth with a wooden wedge, which was partially successful, but still tooth forceps, of the smallest size, could not be introduced between his teeth. While his jaws were thus partially open, he attempted to swallow some warm tea; in the effort, the tumor in his throat burst, and discharged nearly a table-spoonful of pus from his mouth, and it

was supposed that double that quantity passed down into his stomach. He obtained immediate relief, but it was not until about three o'clock, in the afternoon of the next day, that his mouth could be sufficiently opened to permit the extraction of the offending tooth. Upon its removal, there was found attached to its fangs, which were in contact with each other, a sac about the size of a large pea, filled with pus. The cause that had occasioned his sufferings, having been thus removed, I left him, and was soon after informed that he had perfectly recovered.

Inflammation of the investing membrane of the roots of an inferior *dens sapientiæ*, may produce effects similar to these, without occasioning the formation of an abscess in the alveolus. The cutting of these teeth, are sometimes attended with like consequences. The irritation has, in some instances, extended to the lungs and produced consumption. A case of this kind communicated to the author by Dr. M., will be given at the conclusion of the present part of this work.

The occurrence of alveolar abscess, before the shedding of the temporary teeth, often occasions an exfoliation of the alveoli of several teeth, and sometimes of considerable portions of the jaw-bone; whereby the rudiments of the permanent teeth are much injured and sometimes entirely destroyed. The author saw a case, a few years since, in which an abscess of the alveolus of the first lower temporary molaris, had occasioned an exfoliation of the sockets of a cuspidatus and of two molares. About one-half of the alveolar cells of the two bicuspidates and the cuspidatus of the second set, were also exfoliated; thus leaving their imperfectly formed crowns entirely exposed.

CHAPTER SEVENTH.

NECROSIS AND EXFOLIATION OF THE ALVEOLAR PROCESSES.

THE alveolar processes, like other bone, are covered with a membrane, which is called the periosteum. From this, they derive their nourishment and support, and when, from any cause, the connection or vascular intercourse between the two, is destroyed, a necrosis inevitably follows.

When any portion of the alveoli is deprived of vitality, it becomes a source of irritation to the living bone with which it is connected, and in obedience to a law of the economy, an action is immediately gotten up for its removal. The dead part is separated from the living, and is thrown off by exfoliation.

Although the sockets of the teeth are, like other bones, liberally endowed with blood vessels, and affected with necrosis and exfoliation from a like cause and in a similar manner, yet there is, in one particular, a striking difference between them and the other bones of the body. In the alveoli, the loss of substance occasioned by necrosis and exfoliation, is never restored, while in the other bones, it is soon repaired by the formation of new bone.

The exfoliation of the alveolar processes is accompanied by a discharge of matter peculiarly disagreeable and annoying to the patient. As the disease progresses, the gums become soft and spongy, and assume a dark purple appearance.

Mr. Fox has presented us, in his work on the teeth, two drawings of exfoliated alveolar processes. The first represents the alveoli of a central and lateral incisor, and that of the left cuspidatus, with a portion of the maxillæ, extending about five-eighths of an inch above the apex of the roots of the last mentioned tooth.

The subject of this case was a gentleman, whose left lateral incisor became carious; inflammation and pain ensued, together with a swelling of the gums and lip. Instead of consulting a physician, he applied poultices to his face, until suppuration in the alveolus took place, forming an external opening through the gums for the discharge of the matter. After his mouth had remained, for some time, in this condition, he applied to Mr. Fox, who, upon examination, found that not only the decayed tooth had become loose, but also one on each side of it. The first he extracted, and discovered that its alveolus, from the destruction of its periosteum, was quite rough. The adjoining teeth still continuing loose, they were, in a few weeks, removed, and the slight force that was applied, brought with them the alveolar processes of the whole of the three teeth, and also a considerable portion of the jaw-bone. The other drawing of Mr. F. represents an inferior molaris and two bicuspides, together with their sockets and a very large piece of the maxillæ. Their exfoliation originated from the same cause as that in the other case, namely, alveolar abscess.

The author has met with several very similar cases, though not all produced by the same cause, and he has eight specimens in his possession, two of which were presented him by his brother, Dr. John Harris, and two by Dr. Vaneamp, of Nashville, Tenn.

CAUSES.

This affection always results from inflammation and the death of the alveolar periosteum, caused in the majority of cases by dental irritation, but very frequently by the imprudent use of mercurial medicines.

TREATMENT.

In the treatment of cases of this kind, little can be done. So soon, however, as the dead portions of bone become separated from the living, and can be easily removed, they should be taken away with a pair of forceps. To correct the offensive odor, and disagreeable taste occasioned by the constant discharge of fetid

matter, a wash of diluted chloride of soda, or of the tinct. of myrrh may be employed. For any other purpose than this, I have not been able to perceive that local applications were of any advantage. Should constitutional symptoms supervene, tonics and a generous diet should be recommended.

CHAPTER EIGHTH.

SPONTANEOUS DESTRUCTION OF THE ALVEOLAR PROCESSES.

WHILE treating on inflammation and sponginess of the gums, the author adverted to the spontaneous wasting of the sockets of the teeth, and he then took occasion to express a doubt that any such operation of the economy, ever manifested itself, in the absence of local irritation.

CAUSES.

The destruction of the alveolar processes, which is observed in persons of advanced age, has been conclusively shown not to be the result of the decline of the physical powers of the body, when there are no decayed teeth, or tartar in the mouth, and when its fluids are in a healthy state. I think there is nothing more likely to produce this destruction, than pressure on the sockets, resulting from a crowded condition of the teeth. The following remarks of Mr. Fox, strongly support this supposition:

“In a majority of cases, in which this disease occurs,” (from whatever cause produced,) “the teeth are perfectly sound, and from numerous observations, I think I may venture to assert, that persons who have had several of their teeth affected with caries in the earlier part of life, are not liable to loose, by an absorption of their sockets, those which remain sound; but, where the teeth have not been affected with caries in the early part of life, persons, as they approach fifty years of age, and often much earlier, have their teeth become loose from absorption, or a wasting of the alveolar process.”

TREATMENT.

The fact just noticed, cannot have escaped the observation of dentists, and may serve strongly to illustrate and confirm the views given on this subject in a preceding part of the present treatise. The loss of three or four teeth at an early period of life, free the alveoli from pressure, and thus the consequent irritation in their membranes is prevented.

CHAPTER NINTH.

DISPLACEMENT OF THE TEETH BY A DEPOSITE OF BONE IN THEIR SOCKETS.

THE filling up of the alveolar cavities with osseous matter, is a species of exostosis, and is generally confined to the front teeth, and more especially to the incisors, though in some instances it has been known to attack the sockets of the bicuspidæ, and sometimes those of the molars. The teeth, as the deposition progresses, are raised from their sockets, and caused to assume an elongated appearance, and eventually to drop out.

It generally commences in the alveoli of the central incisors, and it rarely happens, that more than one socket is affected by it at the same time. It almost always begins at the bottom of the cavity, though it sometimes commences on one of its sides, and by forcing the tooth against the opposite, occasions a corresponding destruction. Irregularity in the arrangement of the teeth, is, in this manner, not unfrequently produced, especially, when more than one socket is thus affected at the same time. The central incisors are sometimes forced apart; at other times they are forced against each other, and caused to overlap. The deposition of bone, however, being generally confined to the bottom of the sockets, the teeth are more frequently thrust from their alveolar cavities, and when this occurs with a person whose upper and lower teeth fall plumb upon each other, it occasions great inconvenience; for, the projecting tooth must either be thrown from the circle of the other teeth, or, by striking its antagonist, prevent the jaws from coming together.

CAUSES.

My own opinion is, that this affection is brought on by irritation of the alveolar membrane, produced by the pressure of the tooth; for I have observed, that the fangs of teeth, whose alveoli are affected with bony depositions, are generally less conical in their form than others, consequently their pressure in the alveolar cavities is unequal, being greater against the bottom than against the sides. Bony depositions on the sides of the alveoli, are probably occasioned by irregularity of the teeth, whereby their uniform pressure against their sockets has been destroyed. This seems to be the most rational cause that can be assigned for this affection.

That this affection is the result of some peculiar diathesis of the alveolar membrane, is evident, but what causes this peculiar action, yet remains to be ascertained. A diseased state of the gums can have no agency in its production, for it most frequently occurs in individuals, whose gums are perfectly healthy; and if it were the result of any constitutional tendency, all the teeth would be as likely to be affected by it, as those I have mentioned.

TREATMENT.

To remedy this evil, the projecting tooth should, from time to time, as it becomes elongated, be filed off even with the others; but in performing this operation, great care should be taken not to jar it. Mr. Bell, however, objects to this practice. He says, that "instead of remedying the evil, it increases it, by exciting to a still greater degree, the action of the vessels of the periosteum; whilst it also shakes and ultimately loosens the affected tooth." But this objection does not seem to be predicated upon facts or sound reason. The constant striking of a tooth thus circumstanced against its antagonist, must, of necessity, jar it more than the action of a file; and I have usually observed, that teeth thus affected, when left to themselves, generally soon become loose, and if they did not in a short time drop out, were rendered entirely useless. On the other hand, I have known them, by being

from time to time filed down even with the other teeth, to remain comparatively firm in their sockets for years.

As a fitting conclusion to parts third and fourth, I shall add two chapters,—one on the effects of mereury, tobacco and snuff on the teeth, gums, &c. and another on the effects of diseased teeth and gums, on the general health.

CHAPTER TENTH.

OF THE EFFECTS OF MERCURY, TOBACCO AND SNUFF, UPON THE TEETH, GUMS, &C.

MUCH has been said and written on the effects of these articles upon the dental organism, but there still exists much error of opinion on the subject, and for this reason, I cannot pass it by in silence.

EFFECTS OF MERCURY.

Mercury does not, as many imagine, exert any direct action on the teeth; it is only by the effects that it sometimes produces on the gums and secretions of the mouth, that they are injured by its use. When it is given in sufficient quantities, and its use continued long enough to produce ptyalism, however slight, it becomes hurtful to the teeth, and just in proportion as it affects the juices of the mouth, is the corrosive properties of these fluids increased. Hence, it can be considered only as an indirect cause of caries.

The relation which the teeth sustain to the maxillæ, however, is often very seriously affected, and sometimes entirely destroyed by the exhibition of this medicine. Its introduction into the system is generally followed by an increased action of the glands' absorbents, and in no part of the body is this more evident than in the gums. It sometimes occasions a very rapid loss of substance in these parts, so that the teeth, by the destruction of their sockets, are loosened, and, in a few months, caused to drop out. A few years ago, an application was made to me, for a set of artificial teeth and gums, by an interesting young lady, of only twenty years of age, who had lost nearly the whole of her teeth, by the destruction of her gums and alveolar processes, caused

by salivation. She informed me, that about four years before, she had been afflicted with a severe attack of bilious fever, and during its continuance, had taken a great deal of mercury, and, in consequence, had been so badly salivated, that her teeth were loosened, and soon after her recovery, one after another dropped out, in spite of the efforts of several physicians and dentists to preserve them, until only nine remained.

The deposition of tartar upon the teeth, is much increased by the use of this medicine, especially when it affects the saliva. So much, in fact, is the tendency to a deposition of this substance, increased by its exhibition, that persons labouring, for the first time, under a mercurial diathesis, frequently have the crowns of their teeth, opposite the mouths of the salivary ducts, completely coated with it in a few days.

In its administration, therefore, great care should be taken to prevent the injurious effects, that are liable to result from its use. Though, when given with proper precaution, it is perfectly safe in its action, yet, as a general rule, it should never be administered except by a person acquainted with the indications that it is expected to fulfil. It is not my purpose to discuss the merits of this article, but only to notice its effects upon the teeth, gums, &c.—yet at the same time, I cannot forbear deprecating the profuse and careless manner in which it is but too frequently given by persons unacquainted with the curative indications of those diseases for which it is usually prescribed. Its remedial virtues in many diseases, have been amply tested, so that its claims to confidence, rest on no doubtful foundation, and the most eloquent panegyric, that could be pronounced in its praise, is found in the hundreds of lives that it every year rescues from an untimely and premature grave. Its powerful and valuable medicinal properties have gained for it a justly deserved and high reputation; yet the popularity which it has thus justly acquired, has given to its use a license replete with mischief. The imprudent manner in which it is frequently administered, during infancy and childhood, while the permanent teeth are being formed, cannot be too strongly censured. A mercurial action in the system, at these early periods of life, exerts a most deleterious influence on the physical structure of these organs, whereby their future liability to decay is greatly increased.

The symptoms indicating a mercurial diathesis of the general system, are, a slight swelling of the tongue; soreness and increased redness of its edges; soreness, tumefaction, and preternatural redness of the gums, with a tendency to bleed from the slightest injury; fetor of the breath; viscid saliva, accompanied by a more copious discharge than usual; thickening of the alveolar periosteum, and loosening of the teeth. Such are the diagnostics that may be regarded as the criteria of the specific or constitutional action of this medicine.

When given without proper care, and for any considerable length of time, it sometimes gives rise to sloughing and ulceration of the gums, and to necrosis and exfoliation of the alveolar processes, and portions of the jaw. Cases of this kind are of frequent occurrence. Several have come under my own observation within the last ten or twelve years; for the particulars of one of which, the reader is referred to that of Mr. M., page 165. Ulcers of the gums, arising from an excessive use of mercury, sometimes assume a very malignant character, and are exceedingly difficult to cure.

Some are more susceptible to the action of mercurial medicines than others. A single dose will, in some instances, produce ptyalism, while in others, a half dozen may be taken within a few hours of each other, without, in the least, affecting the secretions of the mouth.

The gums, after having been affected with mercury, are ever after more susceptible to the action of irritants, and consequently more liable to become inflamed than they otherwise would have been. "However perfectly," says Mr. Bell, "the effects of mercury may have subsided, even where no permanent injury appears to have been produced in the teeth, and where the common symptoms of its action have entirely ceased to exist, it is not at all an unfrequent circumstance, that after the lapse of a longer or shorter period, sometimes even several years, the teeth become loose, absorption of the gums and alveolar processes take place, and the early loss of the teeth is the consequence of an affection, the disappearance of which, for so long a time, had persuaded the patient that all danger of subsequent injury had ceased."

In conclusion, it is only necessary to observe, that, for the removal of the effects produced on the gums by the use of this medicine, a plan of treatment should be adopted, similar to that previously recommended for spongy and inflamed gums. The offensive fetor of the breath may be corrected by frequently washing the mouth with diluted chloride of soda, or with the tinct. of myrrh.

EFFECTS OF TOBACCO.

In the supposed protective virtues of tobacco to the teeth, many find a ready excuse for its use. But its preservative qualities, if indeed it possesses any, have been greatly overrated. It is undoubtedly true, that, being a stimulant and narcotic, it will sometimes obtund the pain of an aching tooth; but even the relief thus obtained, is at best, only temporary, and principally confined to those unaccustomed to its use; for those, who are in the daily habit of chewing or smoking, are as much subject to tooth-ache, as those who have never used it.

As to the effects produced on the teeth themselves, by tobacco, I do not know that it matters much in what manner it is used, whether by chewing or smoking. Directly, it may be said to affect these organs, neither beneficially nor prejudicially. The increased flow of saliva which it occasions, may, perhaps, by diluting such vitiated humors, as happen to be in any of the interstices, or indentations of the teeth, and thus lessening their corrosive and acrid properties, render them less hurtful; yet this benefit is probably more than counterbalanced by its pernicious effects upon the gums. The constant state of excitement in which they are kept by its use, is apt, unless the greatest attention is paid to the cleanliness of the teeth, to produce, especially in persons of a cachectic habit, a sort of chronic inflammation, and, in those of a strumous temperament, debility.

In treating of the effects of this herb, Dr. Fitch observes: "I have noticed persons having good teeth, who had used tobacco, both smoking and chewing it, for a great number of years. On the other hand, I have seen persons with very bad teeth, who used tobacco. In some constitutions, it removes its irritability;

in others it increases the irritability of the system. And when we look over the causes of caries, diseased gums, &c., we shall find that the fact respecting the operation of tobacco, which we have noticed, explains its good and bad effects on different individuals. There is an acrimony or impurity about some tobacco, which causes it to injure the teeth; but my observations, as to the effect of good tobacco, are, that by some individuals it may be chewed with impunity, and that smoking tobacco may be allowed."

This article, as Dr. F. remarks, differently affects the general health of different individuals. While some can use it with impunity, its effects upon others are such, that many, even after having used it for a number of years, have been compelled to relinquish it entirely. A person of strong constitutional health, full habit, and of a sanguino-bilious temperament, may employ it moderately without injury, and, in some cases, with advantage; but to one oppositely constituted, it is more or less productive of hurtful consequences. It is not, however, my design to treat of the constitutional action of this weed, but only to notice its effects on the teeth.

From the colouring matter contained in tobacco, the teeth of persons, who chew large quantities of it, become, if great care be not taken to keep them clean, in a few years, so much stained, that they present a most filthy and disgusting appearance. Moreover, their teeth usually suffer a more than ordinarily rapid loss of substance, especially when the front ones fall plumb upon each other, from the constant abrasion, to which they are thus necessarily subjected.

Having thus briefly noticed the consequences that are likely to result to the teeth, from the use of this article, when chewed and smoked, I shall proceed to offer a few remarks on the manner in which it affects these organs, when employed as a dentifrice.

EFFECTS OF SNUFF.

Within the last few years, snuff, has in some parts of the country, become quite popular as a dentifrice, especially with

females. The teeth suffer more from the use of tobacco in this form, than in any other. Being reduced to a powder, its fine particles find a more easy lodgment beneath the edges of the gums, around the necks of the teeth, in their interstices, and various indentations and fissures, than when taken into the mouth in any other form. These particles not only thus serve as nuclea, around which the thickened and vitiated secretions of the mouth gather, but also, from their stimulating properties, and their long retention beneath the edges of the gums, and in the crevices of the teeth, are productive of much irritation, both to the gums and dental periosteum.

I have observed, that the gums of persons, who have used snuff as a dentifrice, for a length of time, usually have a dark purple, and sometimes a yellowish appearance, are soft and spongy, more or less isolated from the teeth, and that the teeth themselves are not unfrequently very much loosened. In fact, I do not recollect ever to have known an instance, of an individual who had used tobacco in this way, two or three times a day, for several years, without the teeth and gums being thus affected. In some cases, however, it is much longer in producing these deleterious effects, than in others. Much depends upon the condition of the gums, at the time its use is commenced. If they be healthy, and firmly adhere to the necks of the teeth, it may be employed for a considerable time, without being attended with any very obvious injury; but if they be at all diseased, a deleterious effect will soon become manifest. Viewing the subject in this light, and believing the opinion that I have here advanced, to be supported by the observation of every one, whose attention has been at all directed to the subject, I cannot but condemn the use of this article as a dentifrice; and recommend to every dentist, to particularly caution persons consulting him, and especially females, against thus employing an article that is productive of such pernicious consequences to the teeth.

Nor are its effects upon the general health less injurious. Persons who use snuff in this manner, are generally observed to have a pale, sallow countenance, especially if their constitutional health be at all delicate.

CHAPTER ELEVENTH.

OF THE EFFECTS OF DISEASED TEETH AND GUMS ON THE GENERAL HEALTH.

WHEN we consider the mutual dependenciees that subsist between the teeth and other parts of the body, it will not appear wonderful, when these organs are impaired by decay, that other parts of the system should, in consequence, suffer a corresponding derangement. It is, indeed, a law of the animal economy, that one organ should sympathize with another, and, in fact, it often happens that the organ or part sympathetically affected, assumes a severer and more aggravated form of disease than the one idiopathetically or primarily attacked. With this organ, other parts again sympathize, and thus it sometimes proceeds, until the whole system becomes implicated in one general and complicated disease.

These organs were designed, by an all-wise and beneficent Providence, for important purposes, and it is necessary to the well being of the body, that they should perform the offices allotted them in a perfect and healthy manner. Mastication appears to be the most important of these functions, and will therefore more particularly elaim attention at the present time.

By this process, the food is comminuted and mixed with the saliva of the mouth, and is thus prepared for those changes which it is destined afterwards to undergo. But when the teeth become incapable of performing this function, the aliments are taken into the stomach in an improper state, digestion is slow and laborious, and a double duty is thus imposed upon the digestive and assimilative organs, which, of necessity, must tend to weaken their powers and hasten their destruction.

It should also be recollected, that while the aliments are thus undergoing trituration they are penetrated by the secretions of the mouth; by which the cohesion of their particles is destroyed and they reduced to a pultaceous mass and fitted for deglutition.

Concerning the mastication of the aliments and their mixture with the fluids of the mouth, Magendie proposes the following interrogatories: "Of what use is the trituration of the food and its mixture with the saliva? Is it a simple division which renders the aliments more proper for the alterations that they undergo in the stomach, or do they suffer the first degree of animalization in the mouth?"

Although Magendie confesses that he cannot satisfactorily answer these interrogatories, yet he soon after remarks, "that mastication and insalivation change the savor and odor of the food—that mastication, sufficiently prolonged, generally renders digestion more quick and easy—that, on the contrary, people who do not chew their food, have often, on this account, very painful and slow digestion." He thus admits the importance of the masticatory process, though he cannot tell all the changes that it produces in the food.

Many physiologists suppose that animalization commences in the mouth, and Magendie himself observes of the saliva, "that it is one of the most useful digestive fluids—is favourable to the maceration and division of the food—and assists its deglutition and conversion into chyme."

This, however, is an abstract physiological question, with which we, at present, have but little to do; our object being merely to show the importance of the process, to the healthy operations of other parts of the system. All must admit that the trituration of the food and its mixture with the salivary and mucous secretions of the mouth, are indispensable to a proper digestion. It is, therefore, necessary, not only that the aliments should be well comminuted before they pass into the stomach, but also that the fluids of the mouth, with which they are penetrated, during this process, should be in a healthy state. But decayed and loose teeth, dead roots, turgid and ulcerated gums, and accumulations of salivary calculus, often render these liquids not only acrid and irritating to the mouth, but even nauseating to the stomach.

These fluids, in a healthy state, so far from being injurious to the teeth, are essential to their health and preservation; but when they have become vitiated, they often cause their decay, and sometimes even corrode their enamel.

It has been remarked by several distinguished physiologists, among whom are Rieherand and Magendie, that the salivary fluid has a strong affinity for oxygen; that it readily absorbs it from the air, and readily parts with it to other bodies, so that silver, and even gold, are sometimes oxydized by it. My own observations on this subject, lead me to believe, that healthy saliva will not produce this effect on gold. It has, to my knowledge, been worn in the mouth for twenty, thirty, and even forty years, without ever having become in the least oxydized. In other cases, it has become tarnished in a few days, and in several instances, in forty-eight hours. As the secretions of the mouth become more vitiated, they become more viscid, and as their viscosity increases, so does their affinity for oxygen, and hence the frequent oxydization of gold by the secretions of the mouth.

There are, moreover, other ways besides those just mentioned, in which diseased teeth impair the general health. The putrid and offensive matter that is thrown off by decayed teeth, and turgid and ulcerated gums, imparts to the air that passes to and from the lungs a most disgusting odor, which is sometimes so great as to contaminate the atmosphere of a large room, and render it exceedingly unpleasant for any one, except the person affected, to respire it.

This state of the breath, although it may sometimes be the result of other causes, is a natural and almost inevitable consequence of carious teeth and diseased gums, and, without doubt, frequently occasions, especially in persons of a phthisical habit, very serious affections of the lungs.

Dr. Fitch, on this subject, remarks: "That nature has formed the lungs most delicate and sensible, and susceptible to the slightest injurious impressions. She has also finely tempered the atmosphere for its safe and healthy reception in these delicate organs; but art, accident, or disease may render it impure, unfit for respiration, and cause it, instead of harmonizing with the

lungs in the most perfect manner, and giving to them and the whole system health and strength, to be a baneful influence, armed with pestilence, and scattering the seeds of disease over the lungs, and pouring the streams of deadly poison through every vein in the system."

Nor is it wonderful that the constant inhaling of an impure atmosphere should be deleterious to the lungs; since the poisonous matter with which it is charged, is brought in contact with them at every inspiration.

There are many circumstances connected with disease that are difficult to explain, but there are certain general laws, which, though subject to many variations, will usually serve as guides to the practitioner, in ascertaining the proper curative indications. The same effects do not always follow the same causes. Much depends on constitutional tendencies and the susceptibility of different organs to morbid influences; so that what, in one person, would very soon produce serious, and perhaps fatal results, might, in another, make little or no impression. And it is thus that we account for the different ways in which teeth, in a state of disease, affect different individuals.

But, it may be asked, if a morbid condition of these organs has so great a tendency to impair the health of other parts of the body, why have they not more frequently attracted the attention of medical writers? It is, because the diseases of the teeth have always been considered as coming exclusively within the province of the dentist. A few medical authors, it is true, have adverted to their agency in the production of other diseases—the correctness of whose observations must carry with them the conviction of their truth.

Dr. Rush observes: "When we consider how often the teeth, when decayed, are exposed to irritation from hot and cold drinks, and aliments, and from pressure by mortification, and from cold air, and how intricate the connection of the mouth is with the whole system, I am disposed to believe they are often unsuspected causes of general, and particularly of nervous, diseases. When we add to the list of these diseases, the morbid effects of the acrid and putrid matters which are sometimes discharged from

arious teeth, or from ulcers in the gums, created by them, also the influence which both have in preventing perfect mastication, and the connection of that animal function with good health, I cannot help thinking that our success in the treatment of all chronic diseases would be very much promoted by directing our inquiries into the state of the teeth in sick people, and by advising their extraction in every case in which they are decayed.”*

The influence of diseased teeth on the stomach, and other parts of the system, was noticed by Baglivi, as early as the commencement of the eighteenth century. In his *Canones Medicinæ*, he remarks, “Persons whose teeth are in an unclean and viscid state, though daily washed, have uniformly a weak stomach, bad digestion, an offensive breath, head-ache after meals, generally bad health, and low spirits. If engaged in business or study, they are impatient, and are often seized with dizziness.”†

Physicians of the present day are beginning to pay more attention to this subject than they formerly did. They have discovered that many of the local and constitutional affections of the body are produced by an unhealthy condition of the teeth, and that they cannot be removed without first restoring these organs to health. An eminent physician of this city, informed me, that he had frequently observed the deleterious effects of diseased teeth, and that in chronic and nervous affections, he always examined these organs, and if he found them diseased, directed the patient to the dentist, whose remedial agents alone, had, in several instances, been sufficient to restore the general health. Several other medical gentlemen have favoured me with their views on this subject, which perfectly agree with that just stated.

If it be true, as a late medical writer observes, that the “main-spring in the cure of diseases, is the subduction of its causes,” and if the diseases of the teeth, gums, &c. exert a morbid influence on other parts of the body, then it is essential that these

* Medical Enquiries, vol. 1, p. 201.

† Georgii Baglivi Opera, 1710.

should be perfectly understood, and that in the treatment of those disorders that are produced by them, such remedies should be applied as will tend most effectually to their removal. Unless this be effected, the efforts of the physician, although they may for a time arrest the progress of the disease, will, in the end, prove unsuccessful.

Having thus briefly adverted to the effects of dental diseases, on the system, I will now present a few simple facts in support of what has been here advanced.

In May, 1834, Mrs. R——, a lady of this city, and of high respectability, was advised by her family physician to consult me in relation to her teeth.

Her health at this time was very delicate and precarious, and had been so for six years. She had taken much medicine, and had visited the Saratoga and White Sulphur Springs, but without obtaining any permanent relief. Her stomach was so much disordered, that the lightest kind of food, produced, for several hours after it had been taken, a heavy, burning, and very painful sensation. Her whole nervous system was so completely deranged, that the quick slamming of a door, or any other sudden noise, would almost throw her into convulsions. Her eyesight was much impaired, and her head was affected with an almost constant swimming, or dizziness. On examining her mouth I found that the crowns of the superior incisors, cuspidati and bicuspidates, the inferior molares, a bicuspid on the right, and a dens sapientiæ on the left side of the lower jaw, were involved in general and complicated caries. Their alveolar processes were more or less absorbed, the gums tumefied, soft, spongy, and ulcerated along their edges. The inner surface of the inferior incisors, and the outer surface of the superior molares, were thickly coated with tartar, and the salivary and mucous secretions of the mouth in a vitiated condition.

At the earnest request of her friends, she submitted to the necessary treatment; by which the health of her mouth was completely restored, and with it that of her general system also. I do not mention this case on account of any peculiarity it possesses, but simply because it occurred first to my mind. When, in

addition to the result of the treatment, I state, that she enjoyed almost uninterrupted good health until her teeth became diseased, I think it will not be doubted that her illness was occasioned by a morbid condition of the dental organism.

In September, 1830, I was consulted by Mr. —, at that time a resident of New York. Before I examined his teeth, he informed me that his general health had for four or five years past been very bad, and that he had applied to some of the most eminent physicians of New York, Troy, and Albany, but had not obtained any permanent relief from his sufferings.

The character of the symptoms that at this time prevailed, was very peculiar. His digestive organs were so much deranged, that he was obliged to observe the strictest regimen, and confine himself to the simplest kind of vegetable food. Besides the dyspeptic affection with which he was troubled, he had severe periodical paroxysms of head-ache and vomiting, that recurred at regular intervals of from four to five weeks. These were always preceded by a numbness, that commenced first in his tongue, and thence extended throughout the whole system. This sensation generally continued for about two hours, when it was succeeded by a violent pain in the head and partial vertigo, from which, in about ten hours, he was relieved by vomiting. The effects of these paroxysms lasted about ten days, and the other symptoms had continued, without much mitigation, for three years.

On examining his mouth, I gave it as my opinion, that the diseased state of his teeth was the cause of his affliction. This idea, though perfectly novel to him, he was disposed to believe to be correct, and therefore the more readily consented to the treatment I prescribed. Many of his teeth were much decayed, and nearly all of them were covered with tartar. The roots of some were denuded of the gums—the alveolar processes more or less absorbed—the gums turgid, fungoid, bleeding on the slightest touch, and of a dark red colour—the secretions of his mouth viscid, and their exhalations exceedingly offensive.

Such of his teeth, as could not be perfectly restored, were extracted; and as much of the tartar was taken away, as could

be conveniently removed at one time, and the rest at subsequent sittings. His gums were freely scarified, and a tonic astringent and detergent wash directed to be used three or four times every day. Under this treatment, the local affection of the mouth rapidly disappeared, and in about four or five weeks his teeth and gums became perfectly healthy. His general health also began to improve, and in about two months, it was perfectly restored; and thus it has continued ever since.

The foregoing cases, I think, are sufficient to show the injurious effects that diseased teeth may exercise on other parts of the body.

The following communication has been kindly furnished me by Dr. S——, a distinguished surgeon and physician, of Hanover county, Virginia.

“Sir,—Mr. Abernethy has written a sensible and useful book on ‘The Constitutional Origin of Local Diseases,’ and he might have written another, equally valuable, on the *local origin of constitutional diseases*. He has sustained his views of the former by citing a number of interesting cases, and if any one doubts the existence of the latter, let him read the following; not for its novelty—for surgeons often witness such cases—but as one of the simplest and most palpable of those instances of constitutional disease that arise from local irritation.

“A man by the name of Smith, twenty-three years of age, of sound constitution and valid health, accidentally struck the blade of a thin axe through the patella into the knee joint. Notwithstanding every precaution, a fever sprang up, attended with great constitutional disturbance. The joint suppurated, the fever assumed the hectic character, and reduced the patient so rapidly, that, when the limb was amputated some weeks after the accident, he was nearly a skeleton, and presented all the worst and most disgusting symptoms of pulmonary consumption, except, indeed, that the local disorder was at the knee joint instead of the lungs.

“The local affection was removed under the most discouraging circumstances, for, at the time I was called on to amputate the limb, there was reason to fear that he was too much reduced to survive the operation; but he afterwards rapidly recovered his

health. This case is too plain to need any commentary. Such facts establish, beyond doubt, that constitutional disorder is often produced by local irritation; and we may presume, that it will be more or less severe, according to the character and extent of irritation; hence, it is fair to infer, that the general and local diseases most commonly aggravate each other, and that, if the latter be removed, the health of the patient will generally be restored.

“I have given you below, two cases of disease from irritation consequent on bad teeth, the one of a troublesome and long continued constitutional disturbance; and the other of a local disease, affecting first the membranous structure about the faulty tooth, then the *antrum maxillare* and the bones that constitute the basis of the cranium, and finally the brain itself. Its termination was, of course, fatal.

“CASE 1st. Mrs. S——, a lady of thirty or thirty-five years of age, with several children, in easy circumstances, rather delicate, and of sedentary habits, complained of derangement in the functions of the digestive organs, with much nervous disorder, and a painful sensation about the head, as if there were a pound weight on the top of it, with an occasional tightening of the scalp. This last sensation she compared to that which might be expected from having the scalp forcibly drawn together on the vertex, by the clawing of some animal with talons, as a hawk or falcon.

“Her friends, at first, thought but little of her complaints, and from their eccentricity, were inclined to believe them for the most part, imaginary. The affection of the head, however, and the sensitiveness of the nervous system, evidently increased, until they became so harassing and acute that they deprived her of rest, and made manifest inroads upon her healthful appearance. Medical advice having been now obtained, a regular and carefully directed course of purgatives was prescribed, but with little or no advantage. The cathartics having been discontinued, the *rubigo ferri*, bark, valerian, mineral acids, zinc, *assafoetida*, &c. &c. were next tried, to which were added frictions and tepid salt baths; but still without any material amendment.

“She began to have evident exacerbations of fever towards

evening, which passed off with copious and debilitating sweats that much reduced her, and caused her countenance to assume a sickly aspect. She visited the watering places in the mountains of Virginia, but although her strength was somewhat recruited, the distressing symptoms, with some slight modifications, still continued. She was occasionally confined to the house, but generally able to take some slight exercise in the open air. This state of things had continued for eighteen months, when the attention of her physician was called to an abscess formed near the root of one of her incisor teeth. This brought about an inquiry into the general state of her teeth, of which the following is the result:

"Mrs. S——, at an early period had bad teeth, which, since her marriage, had gradually been growing worse. A few years before the time of which I speak, two of the incisors of the upper jaw were elipt off close to the sockets, and artificial teeth were inserted in the usual way, on the fangs. Much pain, irritation, and swelling of the gums and lips followed the operation, and similar symptoms occasionally occurred for a year or two afterwards, and were frequently attended with alveolar abscesses. The remaining incisors of the upper jaw, and several of the inferior and superior molar teeth, were found to be in a dilapidated state. The alveolar processes of several of the inferior molares were partially destroyed, and one or two of their roots were turned on one side, and clung to the alveoli by the remaining integuments.

"The situation of the mouth rendered it quite probable that the ill health of the patient arose from the irritation produced by the bad state of her teeth; the more so, as her nervous system was exceedingly sensitive. She was persuaded to have the carious incisors, and the worst of the molars removed, and a short time after this was done, her health began to improve. The affection of the head and scalp soon ceased, the nervous symptoms vanished, and she is now in good health, and has a set of teeth decidedly more ornamental than those given her by nature ever were. The speedy restoration of her health, after the removal of her diseased teeth, justifies the conclusion that her bad health depended on the bad state in which these organs were found."

"CASE 2d. Miss W——, a maiden lady of about fifty years of age, in comfortable circumstances, and for the most part addicted to sedentary occupations, had suffered much from a pain in the right cheek. For some time, it was not regarded as of much moment; but, on its continuance, a physician was consulted. He found but a single tooth, one of the second molares, in the superior maxillary of the affected side, and that was in a semi-decayed state. The gums above the tooth, and for half an inch on each side of it, were much swollen and of a livid redness. The tumor seemed spongoid and puffy to the touch; but there was neither fluctuation nor abscess. The patient's health had not sensibly deteriorated. She said the tumor on the gums had existed for many weeks, but had not been attended with any remarkable pain, until the occurrence of that of which she complained. She described it as being deep in the cheek and generally dull, but now and then, for an instant, sharp and lancinating. She said the tooth, for several years past, had been accustomed to ache occasionally, but that, notwithstanding its decayed state, it was very useful, and that she had, therefore, declined having it extracted.

"The immediate extraction of the tooth was, however, thought advisable, and, with her consent, it was effected. A week after the operation, the spongy tumor of the gum continued, without any abatement of the pain in the cheek. The tumor was now laid open with a lancet. It contained no matter; but was filled with those shaggy or shreddy fungi which are often seen to occupy tumors on diseased bones. An abscess, or some other affection of the antrum maxillare, was suspected; a perforation was therefore made in its cavity, and about a table-spoonful of very dark brown matter discharged, which gave the silver spoon, into which it was received, a thin coat of the blackest pigment, and, on account of its offensive smell, was almost insupportable. There was a difficulty in reaching the disease with remedies, and it was thought advisable to enlarge the communication with the antrum. The crown of a small trephine was accordingly applied to the alveolar portions of the superior maxillary, the soft parts having first been dissected up, and a corresponding portion of the bone removed. The end of the little finger could now be inserted

into the antrum, the inner surface of which, it was easily perceived, had, at several points, been denuded of the pituitary membrane, and of the periosteum. The disease was now fairly exposed, and nothing could exceed the offensiveness of its fetor when not corrected by suitable dressings. The usual antiseptics and detergents were locally applied, while tonics and a generous diet were prescribed to sustain the patient's general health, and every effort was made to substitute a healthy purulent secretion for the ill-conditioned and offensive discharge from the antrum, but without any beneficial effect.

"An irremediable necrosis seemed to have taken possession of the superior maxillary of the affected side, which soon began to come away by piecemeal. In the mean time, the soft parts about it were laid waste by the phagedænic character of the ulceration, and the eye of the same side became seriously affected. The disease now progressed rapidly. The perforation of the antrum was made on the 11th of March, 1821, and on the 26th of the May following, the patient was found in a perfect state of apoplexy, the disease having penetrated the bones constituting the basis of the cranium, and seized upon the brain itself. On the 30th of the same month she expired, and was thus released by death, from the most horrible disease that can be conceived, but which had its origin in nothing more extraordinary than a neglected carious tooth.

J. M. S."

No one, after reading the above, can doubt that local, and even constitutional disturbance, and that too of a serious character, does sometimes arise from irritation produced by decayed teeth.

The second of these cases was doubtless the result of inflammation produced by the decay of the tooth mentioned by Dr. S., first in the periosteum of its fangs, then in the alveolar membrane, and finally in the periosteum and mucus membrane of the antrum itself.

Had the tooth been removed when it first became decayed, or when the one which it antagonized was lost, the effects that ensued would, in all probability, have been prevented; for, it is worthy of remark, that whenever a tooth ceases to have an antagonist, the periosteum of its fangs usually becomes inflamed;

and the adjacent parts are, consequently, involved in an unhealthy action.

Two cases, of a somewhat similar character, have come under my own observation. The subject of one of them, was a gentleman of active habits, sound constitution, and about forty-five years of age. That of the other was a lady of from thirty-five to forty years of age, naturally rather delicate in health, of bilious temperament, and sedentary habits. In both of these cases, a dark brown semi-transparent and fetid matter was formed in the antrum, which, in the one instance, was discharged through the natural opening into the nose; and in the other, was confined in the antrum until an artificial opening was made by extracting a tooth and perforating the floor of this cavity. The usual treatment for such cases was steadily pursued for several weeks, but without effecting any thing more than temporary relief, and a permanent cure was at length obtained only by extracting a number of teeth that were decayed and that had been loosened by the wasting of the alveolar processes.

It is highly probable that most of the morbid conditions, to which these cavities are liable, are occasioned by some unhealthy action in the teeth, not only because of their proximity to these organs and the numerous nervous connections that they have with them, but also because the teeth, and their dependant parts, are exposed to frequent diseases, which are usually attended with inflammation.

The following cases of dental irritation were kindly furnished me by Dr. M——, a scientific and eminent practitioner of medicine in this State:

“CASE 3d. In the summer of 1834, I was called on to visit Mr. D. M——, who had come into this neighbourhood to obtain the benefit of the country air, having resided in Baltimore from his earliest youth. When I saw him, he was in the last stage of phthisis pulmonalis. He gave me the following history of his case:

“About eight years previous, he felt a soreness and tumefaction in his gum at the posterior part of his mouth, and as he had never

cut the *dentes sapientiæ*, he thought the disquietude was occasioned by the progress of one of these teeth, and, in consequence, gave it no attention until the soreness and inflammation had extended themselves over the whole surface of the mouth and fauces. The tooth not having protruded through the gum, he consulted his family physician, who advised immediate extraction. He, in conformity with this advice, called on an eminent surgeon dentist of Baltimore; but the tooth not having presented itself, and the cause of his suffering being doubted, the operation was deferred. His sufferings, however, having become intolerable, and the irritation having extended itself to the lungs, producing considerable uneasiness, he determined, if it were at all possible, to have the tooth removed. A few days after, he stated this determination to the dentist. The gum was freely split, and after considerable pain and difficulty, the tooth extracted. The inflammation in his mouth and fauces immediately subsided—his appetite returned, and his general health soon became as good as formerly.

“About three years subsequent to this, his mouth and fauces, under similar circumstances, and from the same cause, became very sore and painful; the inflammation soon reached the lungs and established a confirmed *phthisis pulmonalis*; for which he had taken much medicine, and resided several years in the south, but without obtaining relief. He died a few weeks after my first visit.

“CASE 4th. My friend, Dr. L——, of Frederick, was called to visit a young gentleman, who laboured under violent pain of the face and inferior maxillary, with very great tumefaction of the gums. His sufferings were traced to the roots of one of his molar teeth, which had been broken in an attempt to extract it. His gums, and the glands of his throat, became so much enlarged that it was impossible to remove the offending portion of the tooth; the inflammation, notwithstanding the skilful exertions of the physician, rapidly increased; high and intractable fever supervened; deglutition became totally obstructed, and in a few days, he died.

S. W. M.”

Dr. Koecker gives the history of the following case of hypochondriasis, that came under his observation in 1824:

"CASE 5th. Mr. F——, a literary gentleman in the neighbourhood of London, had been for some years under the medical care of Mr. J. Derbyshire, of Grub-st., Soho, on account of a constant state of derangement of digestion. Much sedentary occupation, and some excessive grief, had, of late, greatly augmented the distressing symptoms generally accompanying this cruel disorder. His disease had assumed the character of hypochondriasis. His spirits were so dejected, and the state of his body was so low, that he was no longer capable of attending to his ordinary business.

"Having had some conversation with Mr. Derbyshire on the influence of diseases of the teeth upon the general health, that gentleman was induced, at his next visit, to inquire into the state of his patient's teeth; and learning that they were in a very deplorable condition, he proposed a consultation with me on the subject.

"After a particular examination, I found every tooth in the patient's mouth more or less carious, or dead, and the gums and sockets in a very diseased state.

"On the 27th of May, 1824, twenty-one teeth and roots were extracted; all of which were more or less in a state of putrefaction, three large grinders only excepted, which were either suffering from complicated caries, or producing morbid irritation upon the other parts from some other cause.

"Four upper and two under incisors, two upper and two under cuspidati, and two under bicuspidates, fourteen front teeth in all, were left remaining. These, and all the other parts of the mouth, were restored to health in the course of about six weeks.

"During the progress of the treatment of the diseases of the mouth, the general health improved very surprisingly, and on the restoration of perfect health to all the remaining teeth, and their relative parts, the patient enjoyed uninterrupted good health, and returned to his ordinary professional avocations."

Dr. Darwin particularly notices the agency of diseased teeth

in the production of hemicrania and ear-ache. In speaking of the former, he says: "This disease is attended with a cold skin, and hence, whatever may be the remote cause, the immediate one seems to be a want of stimulus, either of heat or distention, or some other unknown stimulus in the painful part, or in those with which it is associated. The membranes, in their natural state, are only irritable by distention; in their diseased state, they are sensible, like muscular fibres. Hence, a diseased tooth may render the neighbouring membranes sensible, and is frequently the cause of this disease."

Of sympathetic head-ache, he remarks: "Where it affects a small defined part on the parietal bone or one side, it is generally termed *clavus hystericus*, and is always, I believe, owing to a diseased *dens molaris*."

After having continued his observations for some time, he gives the following case: "Mrs. —, about thirty years of age, was seized with great pain about the middle of the right parietal bone, which had continued a whole day before I saw her, and was so violent as to threaten to occasion convulsions. Not being able to detect a decaying tooth, or a tender one, by examining with my eye, or by striking them with a tea-spoon, and fearing bad consequences from the tendency to convulsions, I advised the extraction of the last tooth of the under jaw on the affected side; which was done, without any good effect. She was then directed to lose blood, and to take a brisk cathartic; and after that had operated, about sixty drops of laudanum were given her, with large doses of bark, by which means the pain was removed. In about a fortnight, she took a cathartic by ill advice, and the pain returned, with greater violence, in the same place; and before I could arrive, as she lived thirty miles from me, she suffered a paralytic stroke, which affected her limbs and her face on one side, and relieved the pain in her head. About a year afterwards, I was again called to her on account of a pain, violent as before, exactly on the same part of the other parietal bone. On examining her mouth, I found the second *molaris* of the under jaw, on the side before affected, was now decayed, and concluded that this tooth had occasioned the stroke of the

palsy, by the pain and consequent exertion it had caused. On this account, I earnestly entreated her to allow the sound molaris of the same jaw, opposite the decayed one, to be extracted, which was forthwith done, and the pain in her head immediately ceased, to the astonishment of her attendants."

He gives, in another place, two more cases somewhat similar in their character to this, and at the same time remarks, that "ear-ache, like hemicrania, is frequently the consequence of association with a diseased tooth."

Dr. Rush mentions two cases, the one of epilepsy, the other of rheumatism, that were produced by decayed teeth: "Some time in the year 1801, I was consulted by the father of a young gentleman in Baltimore, who had been affected with epilepsy. I inquired into the state of his teeth, and was informed that several of them, in his upper jaw, were much decayed. I directed them to be extracted, and advised him afterwards to lose a few ounces of blood any time when he felt the premonitory symptoms of a recurrence of his fits. He followed my advice; in consequence of which, I had lately the pleasure of hearing from his brother, that he was perfectly cured."

CASE 6th. Again, he remarks, "Some time in the month of October, 1801, I attended Miss O. C., with a rheumatism in her hip joint, which yielded for a while to the several remedies for that disease. In the month of November it returned with great violence, accompanied with a severe tooth-ache. Suspecting the rheumatic affection to be excited by the pain in her tooth, I directed it to be extracted. The rheumatism left her hip immediately, and she recovered in a few days. She has continued ever since to be free from it."

Several cases of pain and formation of matter in the ear, and of ophthalmia, produced by a disordered state of the teeth, are given by Jourdain, Koecker, and Fitch, which the limits of this work, and the space I have already given to the present subject, will not allow me to quote; I will, therefore, conclude my remarks on this point, by adding two or three cases of *neuralgia faciei*.

It is now generally admitted by medical writers, that this most torturing and agonizing affection arises more frequently from a morbid condition of the teeth, than from any other cause. The following interesting case is given by Dr. Koecker:

CASE 7th. "Mr. J——, a gentleman of great respectability, a native of this country, but for many years a resident of Smyrna, aged about thirty-nine years, had suffered upwards of ten years with this distressing malady, attended by all its torturing symptoms, in a most unparalleled manner. His whole constitution, but particularly the glandular system, was so much affected as to produce swellings and indurations in the most distant parts, accompanied with great pain and inconvenience, but its effects on his head were frequently agonizing; indeed, he assured me so great were his sufferings, he had been so far driven to despair, as to implore heaven to relieve him, by putting an end to his miserable existence. He repeatedly applied for the best medical and surgical advice that the country could afford, but the real cause of his suffering was not detected; and such was the character of this disorder, that it baffled every exertion, and all the remedies, which were applied for many years. At length, the effects of a sea voyage, and a visit to his native country, were proposed, and at the same time, a trial of such medical measures as he might be able to command in England.

"Immediately after his arrival in London, this patient consulted Mr. Lawrence. This sagacious and disinterested surgeon soon suspected his teeth to be the chief cause of his malady, and recommended him to have my advice without delay, and to submit to any treatment I should deem necessary and proper.

"On examining the gentleman's mouth, I found his gums, and all his alveolar processes, more or less diseased. His double teeth, however, had most especially suffered, and so considerable a part of their sockets was destroyed, that their preservation was rendered altogether improbable. I therefore proposed their immediate removal; and although the gentleman was exceedingly nervous, he acceded to my proposed plan of cure, without the least hesitation.

"February 14, 1826. Thirteen teeth and roots were ex-

tracted, and the mouth was subsequently cleansed with a gentle stimulant lotion every hour or two in the course of the day.

"February 21st. The remaining front teeth of the upper and under jaws were carefully scaled, as far as the diseased state of the gums would allow of, and the patient provided with the means to prevent the re-accumulation of tartar. He was requested to continue the lotion.

"February 28th. The above operation was repeated, and cleanliness particularly recommended.

"March 7th. The same operation was completed, and a perfect removal of the tartar accomplished; the patient was also directed to proceed as before.

"Thus, by the judicious management of the case by Mr. Lawrence, and the above treatment, the patient was now, in less than one month, restored to perfect constitutional health. His mouth was rapidly recovering from a disease, probably of more than fifteen years standing, and the most important of his teeth were saved from total destruction, and permanently preserved."

CASE 8th. The following is one of the many cases of the *douloureux*, or neuralgia *faciei*, produced by disordered teeth, that have come under my own observation. The subject of it was a lady of about forty years of age, of sedentary habits, and naturally of rather a nervous temperament. She had, for several years, been at times afflicted with a most distressing and painful affection of her face, which was pronounced by her attending physician, Dr. D——, to be *tic douloureux*. The pain was sometimes so acute and lancinating that it almost deprived her of reason. It generally commenced near, or a little anterior to the angle of the superior maxillary bone; thence it darted across the face to the ala of the nose, and then to the temple, forehead, and angle of the eye, accompanied with frequent and sudden transitions from one side to the other, twitching and tremors of the muscles of the affected parts, and with a preternatural flow of saliva. Her face, and sometimes the whole of her head, were rendered so sore by these paroxysms, that the slightest touch would produce pain.

These fits, although they generally were of short duration,

frequently recurred as often as ten or fifteen times in twenty-four hours, and sometimes lasted ten, sixteen, and even twenty days, after which they would gradually subside, having subjected her, during their continuance, to the greatest misery, and leaving, after their subsidence, a dull heavy pain in one or both jaws. A sensation similar to this, was always (especially in the right side of the upper jaw) experienced several days before one of these attacks, which often enabled her physician to ward them off, and eventually led to the detection of their cause. These spasms were more severe, and occurred more frequently in cold, damp, and wet, than in warm and dry weather.

Bark, quinine, carb. iron, stramonium, belladonna, and various other tonics and antispasmodics, were prescribed, but without any apparent beneficial effect. Leeching, sinapisms, and epispastics were also of no avail. It was determined, as a last resort, to divide the affected nerve, but before the operation was performed, Dr. D. was induced, by the pain in the jaws always preceding these paroxysms, to examine the condition of the patient's teeth. This examination showed them to be in a very unhealthy state. The molares generally, and those especially on the right side of the upper jaw, were involved in complicated caries. The gums were much tumefied and inflamed, and the teeth sensitive.

Her teeth and gums, from the diseased condition in which they were found, were immediately supposed to have some agency in producing the affection of the face; a consultation with me was, therefore, proposed, and on the 15th of January, 1831, I was requested to visit her.

On examining her teeth, I ascertained that eleven of them were so much decayed, as to render their restoration impracticable. It was therefore determined to remove them immediately, but it was not thought proper, on account of her extreme debility, and the state of her nervous system, that more than two or three should be extracted at a time.

So great was her agitation at the mere thought of the operation, that, notwithstanding the agony she suffered, she could not, on my first visit, be persuaded to have even a single tooth extracted, but requested me to call on the next day, when, she

promised, she would submit to the removal of as many as she possibly could.

I accordingly called on the following day, and to the astonishment of her friends, she allowed all her jaw teeth that were carious, eleven in number, to be at once extracted. This operation immediately revealed the cause of her disease. The roots of three of these teeth were very much enlarged by bony depositions. One of the fangs was, at its extremity, about the size of a pea, those of the other two were not quite so large, but a disposition to exostosis was manifested by all. With the removal of these teeth all symptoms of pain entirely vanished, nor have they since, to my knowledge, returned.

Hufeland enumerates firm and sound teeth among the signs of long life. "For good digestion, *good teeth*," says he, "are extremely necessary; and one, therefore, may consider them among the essential properties requisite for long life, and in two points of view. First, good and strong teeth are always a sign of a sound, strong constitution, and good juices. Those who lose their teeth early, have, in a certain measure, taken possession of the other world with a part of their bodies. Secondly, the teeth are a great help to digestion, and consequently, to restoration."*

"Amongst the most common and painful effects of decayed teeth are, extreme pain, felt not only in the nervous pulp of the body of the tooth, but also along the branches of the nerve which supplies the teeth generally, as well as to the other divisions of the great nerve of which it is one of the chief branches. When we learn that the great nerve of sensation, the fifth of the anatomist, ramifies to the eye, ear, nose, mouth, over the cheek, and supplies the branches distributed to the teeth, and the angle and lower part of the jaw, we can understand why irritation at one part of this great and irregular chain, as of a tooth, should be so sensibly felt at other and even remote parts; for even the temples and side of the head are not strangers to the pain of tooth-ache. It is not necessary, however, that there should be always much, or even any pain from a decayed tooth, to cause

* Journal of Health, July, 1831.

numerous troublesome pains of the face and head; old stumps are a common cause of these affections, which, when of frequent recurrence, require at last a complete removal of the offending cause, that is, extraction of the decayed stumps.

"Nor is the secondary irritation from decayed teeth always confined to the face and head: it not unfrequently displays itself in all the symptoms of indigestion; and, at times, of periodical or intermittent fever, with many anomalous nervous symptoms, resembling hysteria."*

"From the presence of carious teeth, or decayed portions of teeth, many evils, both local and general, ensue, besides inflammation and abscess. They are frequently the cause, and the sole cause, of violent and continued head-aches; of glandular swellings in the neck, terminating in, or combined with, abscess; of inflammation and enlargement of the tonsils, either chronic or acute; of ulcerations of the tongue or lips, often assuming a malignant action from continued irritation; of painful feelings in the face, *tic douloureux*, pains in the tongue, jaws, &c.; of disordered stomach, from affection of the nerves, or from imperfect mastication, of continued constitutional irritation, which may give rise to serious diseases."†

The foregoing are a few of the many cases that might be brought forward to illustrate this part of my subject, but the space to which I am limited, will neither allow of their introduction nor permit me farther to cite the many respectable authorities that might be adduced to this same point. I will, however, subjoin the following case reported by the author for the *Maryland Medical and Surgical Journal*.

CASE 9th. Mr. S——, a resident of a neighbouring county, of a full habit, and slightly disposed to scorbutus, had, for a little more than two years, been the subject of an obstinate and distressing affection of the left nasal fossa, and of frequent attacks of pain, which he represented as being, at times, almost excruciating—commencing immediately over the first left superior molar, thence shooting back to the angle of the jaw, then to the

* *Journal of Health*, Aug. 1831.

† *Liston's Surgery*, p. 278.

ala of the nose, inner angle of the eye, and not unfrequently to the top of the head. Ulceration had taken place in the mucus membrane of the affected nostril, and a thin fetid matter, occasionally streaked with pus and blood, was almost constantly discharged, excoriating the parts with which it came in contact. The cavity of the nostril had become so much closed by the thickening of its membranes, that the passage of air through it was prevented; the external integuments had assumed a dark florid appearance, and become considerably tumefied and sensitive to the touch.

His teeth having been suspected, though to all appearance perfectly sound, as having some agency in the production of the neuralgic affection, he was directed to a dentist to have them examined, but as none of them exhibited any signs of decay, it was thought to be dependent upon some other cause. Accordingly the remedial means usually employed for this, as well as those for the other affection under which he was labouring, were prescribed; but from their use, although continued for several months, and under a variety of modifications, he derived no benefit.

His complaint becoming more and more aggravated, he at length became apprehensive as to its result, and determined by the advice of his friends, to visit several of the medicinal springs in Virginia. At one of these he met with an eminent medical gentleman from one of the northern cities, whom he consulted, but neither from his prescription nor the use of the waters of any of the springs that he visited, did he obtain the slightest relief, and after remaining from home two months, he returned in a state almost bordering on despair.

To add to his affliction, he about this time, began to be annoyed with a constant pain in the region of the antrum of the affected side. This, in connection with a soreness in a tooth immediately beneath, which he had felt throughout the whole course of his protracted and complicated disease, but which had not until now been sufficiently great to attract particular observation, soon led to the discovery of the cause both of the nasal and neuralgic affections, and also to the means by which they were finally cured. The pain in his jaw continuing to increase, and from its

resemblance to tooth-ache, he was induced, September 9th, 1839, to apply to me for advice. From the description which he gave of it and the other circumstances connected with the case, the belief that the antrum was diseased, and that a morbid condition of some one or more of his teeth or their sockets, had been chiefly instrumental in its production, at once forced itself upon me. With a view of satisfying myself more fully on this point, I gave his mouth a careful examination. His teeth, at least so far as their crowns were concerned, were all free from disease, but the socket of the first left superior molaris, which was that of the sensitive tooth, was considerably wasted—the tooth itself, particularly its outer and posterior surfaces, thickly coated with tartar, slightly loosened and partially protruded from the jaw; whilst the surrounding gum was inflamed and spongy. The tooth having thus, as it would seem, from some cause or other, become obnoxious to the parts within which it was contained, and as it had no antagonist, its removal appeared to constitute the first and principal indication of cure. To this, upon its being advised, he readily submitted. The operation was followed by a sudden gush of thin fetid matter from the antrum, which communicated with the socket of the tooth by an opening sufficiently large to admit of the easy introduction of the end of a small goose-quill, and a subsidence of pain. The cause of his complicated malady was now revealed. The roots of the tooth were found to be greatly enlarged by exostosis.

The intervening transverse and longitudinal alveolar walls had been destroyed, and the place which they had formerly occupied filled with fungi. The edges of the surrounding wall were considerably wasted, and its surface interiorly, rough and enlarged.

A strong solution of *argentum nitratum* having been applied to the diseased socket, by means of a camel's-hair pencil, and the antrum syringed out with diluted tinct. myrrh, which last was directed to be repeated twice a day as long as the opening into that cavity should remain unclosed, the balance of the cure was entrusted to the restorative energies of the economy.

The following day he left the city, and I heard no more of him for six weeks: at the expiration of which time he again visited it, and called to inform me of the amendment that had taken place

in his condition. He was now able to breathe through his left nostril almost as freely as the right—the discharge from it was greatly diminished and of a more healthy character. He had had but one return of his neuralgic affection, which occurred the fourth day after the removal of the tooth, and was less severe than any of the former paroxysms. The opening into the antrum had closed, and the socket was rapidly filling with healthy granulations.

December 3d. I again had the satisfaction of seeing him, and of being informed that every vestige of his nasal and neuralgic affections had disappeared.

REMARKS.

The circumstances connected with the history of the foregoing case would seem to justify the conclusion, that the irritation produced by the enlargement of the roots of the tooth, had given rise to a morbid excitement in the mucous membrane of the antrum maxillary—that this had extended to that of the left nostril, where the parts being more exposed to external irritating agents, had taken on a new and more aggravated form of disease; and that the neuralgia was the result of the irritation in the nose, antrum, or socket, and most probably the last. How far the deposition of tartar that had formed on the tooth may have been accessory to the exostosis, is a question perhaps not easily solved. That it might produce such an effect can very readily be conceived, for when we take into consideration the morbid influence the presence of this substance frequently exerts upon the secretions of the mouth, the gums, and alveolar processes, it will not appear at all strange that it should give rise to this. The disease being dependent on inflammation of the periosteum of the roots of the teeth, may be brought on, when favoured by a constitutional tendency, by any thing producing preternatural excitement in these membranes, and that salivary calculus often does this, is a fully recognized axiom in dental pathology. But how far it may have been concerned, either primarily or secondarily, in its production in this instance, I will not take upon myself to determine, inasmuch as there was one other circumstance connected with the history

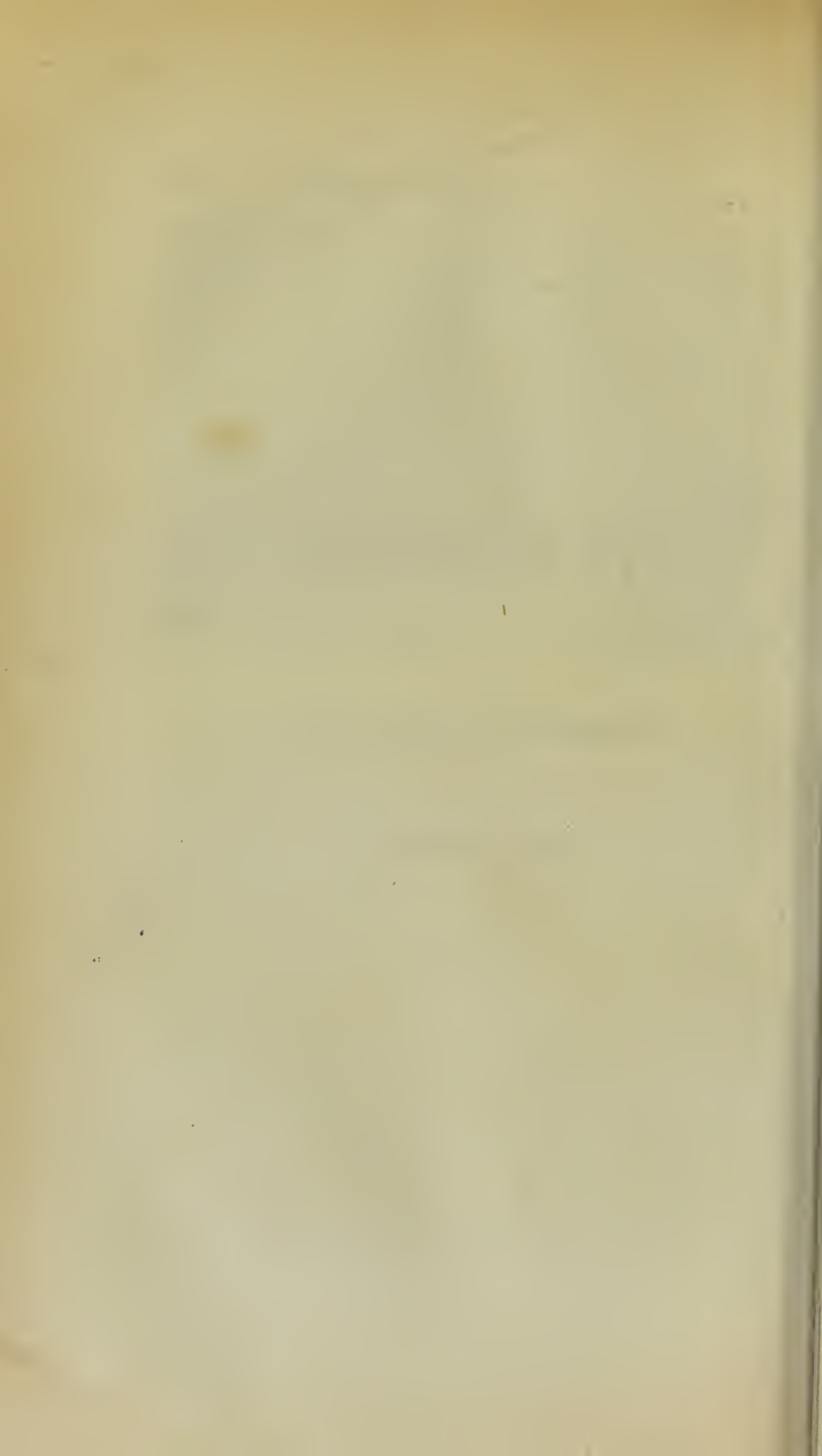
of the case, that may have been the primary cause of the whole disturbance. That was, the want of an opposing tooth, against which for this to act; and it may be well here to remark, that whenever this happens, especially to a superior molaris, and in the present case, it had existed, as I was informed, for about seven years, the surrounding gum is apt to become inflamed, the periosteum of its roots morbidly excited, and the socket to waste and sometimes to become gradually filled with ossific depositions, as though nature, conscious that the organ was of no further use, exerted her energies to expel it from the jaw. This tendency, every dentist of observation and experience must have noticed, and Dr. Koecker, a distinguished European practitioner, in accordance with what would thus seem to be a law of the economy, recommends, as has before been stated, the extraction of all such teeth; but, as there are frequent instances where, by proper attention to their cleanliness, they may be permitted to remain with impunity, this advice should not always be followed.

PART FIFTH.

DISEASES OF THE MAXILLARY SINUS,

AND

THEIR TREATMENT.



PART FIFTH.

CHAPTER FIRST.

PRELIMINARY REMARKS.

IT was not until the knowledge of anatomy had made considerable progress, that the existence of this cavity was known. CASSERIUS, an anatomist of PADUA, who flourished during the latter part of the sixteenth and early part of the seventeenth centuries, is said to have been the first to discover it; but no correct description of it was given, until about the middle of the latter;—to NATHANIEL HIGHMORE, author of a treatise on anatomy,* published in 1651, the credit of this belongs. Hence, its name, "*antrum highmorianum*."

This cavity is subject to some of the most formidable and dangerous diseases the medical or surgical practitioner is ever called upon to treat; and yet there are few incident to the human body, that have not received more attention from writers on pathology and therapeutics than these. Diseases are sometimes here met with, over which neither the surgeon nor physician can exercise any control, and whose progress is only arrested with that of the life of the unfortunate sufferer.

All of the diseases to which the antrum maxillare is subject, however, are not of so dangerous a character; some are very simple and easily cured, but even those which are regarded as the least dangerous, and that yield most readily to treatment, when instituted during their incipient or early stages, often, if

* This work is entitled "*Corporis Humani Desquisitio Anatomico*."

neglected, or if improperly treated, assume a new and so aggravated a form, as to bid defiance to the skill of the physician and surgeon. While on the one hand, the most simple affections that are here met with, may by neglect or improper treatment, ultimately become incurable; those on the other, which are considered as the most malignant and dangerous from their inception, might, I have no doubt, by a timely and judicious employment of suitable remedies, be effectually and radically removed.

The form which the disease puts on, it must be admitted, is determined by the state of the constitutional health or some specific tendency of the general system, and we can therefore readily imagine, that a cause which in one person, would give rise to simple inflammation of the lining membrane, or mucous engorgement of the sinus, would in another, produce an ill-conditioned ulcer, fungus hæmatodes or osteo-sarcoma. Simple inflammation and mucous engorgement not unfrequently cause caries and exfoliations of its surrounding osseous tissues, and as a consequence in some instances, even the destruction of the life of the patient.

The importance of early attention to these diseases is very apparent, and this is the more necessary as it is often difficult, and sometimes even impossible to determine the character of the malady, until it has progressed so far as to have involved, to a greater or less extent, the neighbouring parts; when, if it has not become incurable, its removal is, at least, rendered less easy of accomplishment. It may therefore, be safely assumed, that in a very large majority of the cases of disease of the maxillary sinus, the danger to be apprehended, results more from neglect, than any necessarily fatal character of the malady, so that in forming a prognosis, the circumstances to be considered, are the state of the constitutional health, the progress made by the affection, and the nature of the injury inflicted by it upon the surrounding tissues. If the general health be not so much impaired as to prevent its restoration by the employment of proper remedies, and the disease has not inflicted extensive injury upon the neighbouring structures, the prognosis will be favourable; but if the functional operations of the body have become very much deranged and the bones of the face and nose seriously implicated with the affection of the

sinus, the combined resources both of medicine and surgery will prove unavailing.

In young and middle aged subjects of good constitutions, a morbid action may exist in the antrum for years without giving rise to any very alarming symptoms, while the same species of affection in another less healthy would rapidly extend and degenerate into a form of disease so malignant as to threaten the speedy destruction of the life of the patient. Medical history abounds with examples of this kind, and they conclusively establish, that the state of the general health and habit of body, whatever may have been the primitive characteristics of the malady, ultimately determine its malignancy; and in the treatment of affections of this cavity, as well as other local diseases of the body, these should not be overlooked.

Independently of the danger of the affections seated here, they, for the most part, are very loathsome, and subject the patient to great annoyance. They change the qualities of the secretions and cause them to exhale a very nauseating and fetid odor. This, in many instances, is almost insufferable to the patient, and when it is considered that they must have egress through some opening, and when prevented from escaping through the natural one into the nose, as is often the case, that they evacuate themselves through an artificial one formed by art, or effected by their own disorganizing qualities, through the cheek, alveolar border or palatine arch, the inconvenience can readily be imagined to be great. They are not only exceedingly annoying, but are also sometimes very painful; the degree and constancy of the pain vary according to their nature and the nervous susceptibility of the individual. The pain is sometimes lancinating and excruciating almost beyond the power of endurance, but when very severe, it is usually less constant; at other times it is slight, but more constant.

The occurrence of disease in this cavity is often very insidious. It not unfrequently happens that it exists for weeks and even months before its presence is suspected—the slight uneasiness being attributed to some morbid condition of the teeth or gums, and the symptoms attendant upon one description of affection of this cavity, are

often so similar to those that accompany another, that it is impossible to determine its true character until it has made considerable progress.

Man is not the only animal subject to morbid affections of the antrum maxillare. Dr. Wm. Cook,* states that while residing in the country, a disease prevailed among cattle which caused them to go mad, and it was believed they had been bitten by a mad dog. Having a desire to ascertain the seat and nature of the malady, which was attended with such singular, and in most instances, fatal effects, he examined the head of one that had died of it. His researches were first directed to the brain, but as no morbid appearances were there observable, he next laid open the superior maxillary cavity, and to his great astonishment, found it filled with fetid matter. Although he was fortunate enough to discover the seat of the disease, he does not attempt to give an explanation of its cause, nor does he even state the season of the year at which it prevailed. The affection however, evidently consisted of a mucous engorgement of the sinus, accompanied, most probably, by ulceration of its lining membrane and caries of its osseous walls.

The morbid affections of the maxillary sinus, are, for the most part, similar to those of the nasal fossæ. There is, however, a form of disease which seems to be peculiar to this cavity, viz. mucous engorgement. Deschamps mentions two, dropsy and purulent accumulations,† the first of these, properly speaking, is never met with in this cavity, and authors who have enumerated it among its diseases have evidently mistaken mucous engorgement for it. The fluids that accumulate are of a mucous or mucopurulent character, except when they are the result of the disorganization of some of the surrounding parts; then they are sanious.

Previous to the discovery of this cavity, the diseases of the maxillary sinus were little understood; and though their distressing and often fatal effects must have been frequently observed,

*Vide, note to Morgagni's work on the Seats and Causes of Diseases, &c. &c. vol. i. page 167.

† Vide, Traite des Maladies des Fosses Nazales et de leurs Sinus; art. v. sec. 2, page 226.

their real seat was not known, and consequently the means employed for their cure could seldom have succeeded in accomplishing it. They were thought to have originated within the substance of the osseous tissue, and I have no doubt, that many of the supposed cases of *spina ventosa* and *tumors* of the superior maxillary bone, spoken of by some of the older writers, were morbid affections of this cavity. Even subsequently to the knowledge of its existence similar mistakes have been committed. Many cases of disease of the superior maxilla are narrated by authors without any mention, or even allusion to this cavity, which, from the description given of them, were obviously seated in it. Several such are recorded by WISEMAN, in his treatise on surgery, published in 1676.* Notwithstanding his seeming ignorance of the seat of these affections, he had a pretty correct idea of their curative indications, for the plan of treatment which he adopted differs but little from that pursued at the present day.

The most simple form of disease that occurs, is inflammation of its lining membrane, and this in most instances may be said to precede all others. It often subsides spontaneously, but when it continues for a long time, is apt to become chronic, and then not unfrequently gives rise to other and more formidable kinds of disease. When unattended by any other morbid affection, either local or constitutional, it is easily cured.

A purulent condition of the fluids of the antrum is a very common affection, but is seldom met with in persons of good constitutions. It seems to be dependent upon a bad habit of body and inflammation of the pituitary membrane of the sinus, which last results more frequently from dental irritation than any other cause. This condition of the secretions, sometimes gives rise to caries and exfoliation of portions of the surrounding bone, and to fistulous ulcers; but when dependent upon no other local cause than simple inflammation of the mucous membrane, it is seldom that such effects result. When complicated with other morbid conditions of the cavity, they are not unfrequent.

All purulent conditions of the secretions of the pituitary mem-

*Vide, Book iv. chap. iv. Obs. 12, 13 and 17, pages 265, 280 and 281.

brane, are by some denominated abscess. The name, however, as is justly remarked by Mr. Thos. Bell, is improper. Abscess is a different affection, and very seldom occurs here; yet, instances of it have been met with, at the extremities of the roots of teeth that had perforated the sinus; and it sometimes happens that when an abscess is seated in the alveolus of a superior molaris, the matter, instead of making for itself a passage through the socket of the tooth on either side, escapes into this cavity, and finally with its secretions, through the nasal opening. Mr. Bell, the gentleman whose opinion has been referred to, describes a case of abscess seated in the upper part of the antrum; but this as he himself states, is the only one of the kind on record.

Ulceration of the lining membrane is an affection less frequently met with. It is rarely, if ever, idiopathic, but seems rather to be dependent upon some other local malady or some specific constitutional vice. Scorbutic and scrofulous dispositions, and those of a venereal taint, are by far more liable to be affected with ulceration of this membrane than persons of sound constitutions. Consequently local remedies are seldom adequate to its cure. It is almost always complicated with fungi of the membrane and caries of the walls of the sinus, and when neglected, it sometimes takes on a cancerous form and becomes incurable.

Next in the order of arrangement, which I propose to adopt, is caries of its walls. This, though always complicated with one or more forms of diseased action, seems nevertheless to be worthy of separate consideration. Like ulceration of the lining membrane, it is an effect of some one or more affections. It may result from accumulation of the secretions of the sinus, ulceration, or from tumors.

The occurrence of fungus and other kinds of tumors is less frequent than any of the preceding affections; yet this cavity is not exempt from them, and they constitute the most dangerous description of diseases to which the superior maxilla is subject. Although it is probable, in their incipient stage, they might in nearly every instance be radically removed, it is seldom they are cured after they have attained a very large size, and have impli-

cated in their morbid action to a considerable extent the circumjacent tissues. They have, however, been successfully extirpated even after they had acquired great volume, and implicated to such an extent the surrounding parts, as to have rendered necessary the removal of the whole of the superior maxillary bone. They usually grow with great rapidity, and when not radically removed, are generally soon reproduced.

Besides these, other varieties of disease are occasionally met with here; and the antrum is liable to injuries, from blows and other kinds of mechanical violence; from the introduction of insects and foreign bodies; but of these, it is not necessary to speak in this place, as they will hereafter come up for special consideration.

In regard to the causes of the various morbid affections of the maxillary sinus, there exists some diversity of opinion. It is thought by some that these diseases often result from certain specific constitutional vices, independent of any local agency whatever; others attribute them to the obliteration of the opening of this cavity into the nose; some again, suppose them to be dependent upon causes similar to those giving rise to diseases of the nasal fossæ; while others contend they are produced by dental irritation. That all of these may exert an influence upon this cavity, is undeniable; but some do not do it to the extent, and in the manner which many seem to suppose; and, while I do not profess to be singular in the views which I entertain upon this part of the subject, I hope to be able to point out some errors, into which, not a few have evidently fallen. Opinions are frequently adopted, and conclusions arrived at, neither warranted by facts nor supported by sound philosophy. And as it is important to a correct knowledge of the therapeutical indications of diseases, that their causes be understood, I shall endeavour, in the course of this treatise, to point out those principally concerned in the production of the several morbid affections of the maxillary sinus; or rather to explain the different kinds of influence, that are capable of affecting this cavity. For, as I have before stated, I do not deny that it is to the presence of some one or more of these, that the diseases to which it is liable are attributable.

In carrying out this design, it is not my intention to indulge in vague speculation; I shall rely principally upon facts, to establish the views which I propose to advocate. For one fact, is worth a dozen theories based upon no better foundation than mere hypothesis. Although the detail of these be tedious and comparatively uninteresting, it is only by their aid we can hope to arrive at truth; and this is most desirable.

The effects exerted upon this cavity by a bad habit of body or constitutional vice, are not such as many seem to suppose. They do not amount to perceptible manifestations of disease; but only consist in an increase of susceptibility of the tissues of which it is composed, to morbid impressions; and when an unhealthy action is lighted up in it, a more aggravated, and not unfrequently different form of disease than that which would otherwise have been produced occurs. Not only is the susceptibility of this cavity to morbid impressions increased by an ill habit of body, or constitutional vice, but also, not unfrequently, every part of the whole organization; and this increase of susceptibility, may exist for years, and not result in marked demonstrations of either general or local disease. If the body, or any part of it, in the meantime, be subjected to the action of morbid irritants, disease, either general or local, according as the whole or only a part of it is acted upon by them, will be the result. Again, the same cause of irritation acting upon another in whom there exists no constitutional vice, and who, consequently, is not possessed of so great an aptitude to be morbidly excited, might not originate any appreciable unhealthy action.

Thus it may be seen, that disease of the maxillary sinus is dependent upon some other determining cause than a particular disposition or vice of the general system; and yet, without this, no morbid effects would be produced; or if produced, would be of a different and less aggravated character. Any disposition or vice of body, which weakens the vital energies of the system, increases the susceptibility; or what in medical language it would be more proper to term, *excitability* of all its parts; those of this cavity equally with the rest. There are various kinds which

have this effect: as for example, the scorbutic, scrofulous, venereal, mercurial, &c. &c., each of which, may influence the character of the morbid action excited in it, in a manner peculiar to itself, or similar to that which might be exercised by another, and cause it to assume a greater or less degree of malignancy, according as the functional operations of the body generally are more or less enervated by it.

This seems to be the way in which a bad habit of body is capable of affecting the maxillary sinus. It is a predisposing, but not an exciting cause of disease; and it is important that this distinction should be borne in mind. The one, should never be confounded with the other, because an error of this sort, might, and would in many instances, lead to the adoption of incorrect views concerning the therapeutical indications of the disease.

I might enlarge upon this part of the subject, but it is not necessary to do so, inasmuch as I shall have occasion to advert to it hereafter.

Inflammation and ulceration of the pituitary membrane of the nose, sometimes extend themselves to the maxillary sinus, but a morbid action is not so frequently excited in this cavity, by an unhealthy condition of the nose, as the intimate relationship subsisting between the two, might lead some to believe. It is seldom that both are affected at the same time. Hence I infer, that, although lined by one common membrane, the propagation of disease from one to the other, is an occurrence which rarely happens.

Although diseases of the nasal fossæ, may occasionally give rise to a morbid condition of the maxillary sinus, it is questionable whether the exciting causes of the affections met with, ever act directly upon this cavity. Concealed as it is, within the substance of the superior maxilla, and communicating with the nose only by means of a very small opening, it would seem to be beyond the reach of most of the causes, to the action of which, diseases of the nasal fossæ are attributed.

The obliteration of the opening of this cavity, is sometimes caused by disease in the nose, and when this happens, it is followed by a mucous engorgement of the sinus, inflammation of its

lining membrane, distention of its osseous walls, and not unfrequently by other and more complicated forms of disease. But the closing of this opening is oftener an effect than a cause of disease in this cavity, and it generally re-establishes itself without any assistance of art, after the cure of the affection which caused it.

If all the circumstances connected with the history of the diseases under consideration could be ascertained, I think it would be found that these affections are more frequently originated by a morbid condition of the teeth, gums and alveolar processes, than any other cause. There are no sources of irritation to which this cavity is so much and so often exposed, as that of the dental organism. It is separated from the apices of the roots of the superior molares and bicuspidēs only by a very thin plate of bone, and it is sometimes even penetrated by them,* so that it could scarcely be otherwise than that aggravated and protracted disease in the teeth and alveoli beneath it, should exert an unhealthy influence upon it. The pain occasioned by diseased teeth, is often very severe, sometimes almost excruciating, and the inflammation excited by them in the alveolo-dental periosteum and gums, frequently extends itself to the whole of one side of the face. It could hardly be possible, therefore, for this cavity to escape. Alveolar abscess, and sometimes necrosis and exfoliation of the socket of the affected tooth, result from the inflammation thus lighted up. It often happens, that the gums and alveolar periosteum are affected for years with chronic inflammation, and other morbid affections.

If, in addition to these facts, other proofs be necessary to

* Some are of the opinion that the maxillary sinus is never penetrated by the roots of any of the teeth, except in cases where disease has destroyed the thin plate of bone which usually covers the apices of those immediately beneath it. But that this is incorrect, is proven by the fact, that both antra are often perforated by them, which would hardly be the case were the perforations the result of disease, for it rarely happens that both cavities are affected at the same time. Indeed, I have never, except in a solitary instance, known one antrum to be perforated by the roots of the teeth, when the other was not similarly penetrated; and it is by no means uncommon for the floor of this cavity to be pierced by the apices of the roots of the first and second superior molares.

establish the agency of dental and alveolar irritation in the production of disease in the maxillary sinus, they may be had. Many of the affections here met with, are often cured by the removal of diseased teeth after other remedies have been employed in vain, and that, without even perforating the antrum. This would not be the case, if the irritation arising from them did not extend to this cavity, and if the disease in it were not dependent upon the irritation produced by them.

Most writers on these affections agree in ascribing them to a morbid condition of the teeth and alveoli. There are some, however, who though they admit that dental irritation may perhaps occasionally give rise to them, seem nevertheless to attribute their occurrence in the majority of instances to other causes, such as irregular exposure to cold, blows upon the face, and certain constitutional diseases. Deschamps asserts, that "if we except caries of the teeth, and the discases of the dental periosteum, which can be communicated to the pituitary membrane, the causes of these diseases are unknown." These are important exceptions, but that they are sometimes traceable to other causes, there can be no question. It is very certain, however, that these give rise to them more frequently than any other, and in their treatment, the state of the health of the teeth and alveoli should never be overlooked.

I shall now proceed to the consideration of the different affections of this cavity, under their respective and appropriate heads.

CHAPTER SECOND.

OF INFLAMMATION OF THE LINING MEMBRANE.

As has before been intimated, inflammation when not complicated with any other morbid affection, is the most simple form of disease to which the pituitary membrane of the antrum maxillare is subject. It precedes and accompanies all others that are met with, and it will therefore be proper to offer a few remarks upon it, before entering upon the consideration of those of a more aggravated nature.

Shielded, as the pituitary membrane of this cavity is, from most of the acrid and irritating agents to which it is exposed in the nasal fossæ and some other cavities of the body, it would rarely be affected with inflammation, were it not that it is frequently acted upon by morbid excitants, whose immediate influence seldom extends beyond the alveolar border and face. Exposed as it is, to the action of irritants of a very aggravated kind, inflammation of it, is of frequent occurrence—more so perhaps, than many are aware of, and it is to this, that those deep-seated pains in the superior maxilla and face, which are usually denominated rheumatic, are, in many instances, attributable.

Inflammation of the lining membrane of the maxillary sinus, when not complicated with any general morbid tendency, or constitutional predisposition, seldom gives rise to any other form of diseased action; and it usually subsides spontaneously on the removal of the cause that induced it. This membrane in good constitutions, is less subject to inflammation, and consequently, to any other description of morbid action, than those in whom exists some vice of body, or unhealthy predisposition. Febrile and gastric affections, eruptive diseases, such as measles, small-pox, &c. &c., syphilis, an excessive and protracted use of mercur-

rial medicines, a scorbutic or scrofulous diathesis of the general system, and in short, every thing that has a tendency to enervate the vital powers of the body, increases its irritability.

When in a healthy condition, it secretes a slightly glutinous, transparent and inodorous fluid, by which it is constantly lubricated, but inflammation in it changes its secretions; it causes them to become vitiated; at first, to be less abundant, afterwards to be secreted in larger quantities than usual, to be more serous, and so acrid as sometimes to irritate the membrane of the nose over which they pass after having escaped from the antrum. It also causes them to exhale an odor more or less offensive, according as the inflammation is severe or mild. It moreover gives rise to a thickening of the membrane, and sometimes to an obliteration of the nasal opening. This last rarely occurs, but when it does happen, an accumulation of the secretions and other morbid phenomena, of which I shall hereafter treat, result from it as a necessary consequence.

Inflammation of the pituitary membrane of this cavity, is sometimes followed by inflammation of that of the nasal fossæ; but I am of the opinion, that when this happens, it is occasioned by the acrid qualities of the fluids discharged from the sinus into the nose.

If at any time during the continuance of the inflammation, the patient is attacked with severe constitutional disease, the local affection will be aggravated, and sometimes assume a different character.

The inflammation when long continued, degenerates into a chronic form, and is sometimes kept up for several years, without giving rise to any other unpleasant effects, than occasional paroxysms of a dull and seemingly deep-seated pain in the face, and a vitiated condition of the fluids of the cavity. The slightly fetid odor which they exhale, ceases to be annoying or even perceptible to the patient, when he becomes accustomed to it.

SYMPTOMS.

The symptoms by which this affection is characterized, though not always precisely the same, are nevertheless, for the most part, very similar. Boyer describes them to be severe, fixed, and deep-seated pain under the cheek, extending from the alveolar border to the lower part of the orbit, local heat, pulsation, and sometimes fever. He however tells us that these symptoms are not always present, and that the disease sometimes exists when it is not suspected. I apprehend that this is never the case. Other affections of the face and superior maxillary, may be mistaken for this, and this for others: but that it should exist without being attended with pain or any other signs indicative of its presence, I cannot believe to be true, and I cannot imagine how he arrived at such a conclusion.

Deschamps distinguishes the symptoms from those of other affections of this cavity, by "a dull, heavy pain in the region of it," which he says, "becomes sharp and lancinating," and extends from the alveolar arch to the frontal sinus. The disease goes on without interruption, increasing until the superior maxilla of the affected side is more or less involved. This malady, he tells us, cannot be confounded with any other, if there is no external visible cause; it differs, he says, from a retention of mucus, by being painful at the commencement, and by not being accompanied with swelling of the bones; he distinguishes it from polypus, as that causes no pain; and from cancer, which occasions pain of a different kind. "Suppuration and ulcers have peculiar signs which cannot be confounded with those of inflammation." Pain in the molar, and bicuspid teeth, accompanied by a sense of fluctuation in the parts, he seems to regard as a very certain indication of inflammation, and especially when joined to the other symptoms. "If an external cause is discovered, it" he says, "will furnish a certain diagnosis;" he also mentions fever and head-ache as almost invariable accompaniments.

The inflammation, if not subdued by appropriate remedies, after having continued for a length of time, gradually assumes a chronic form; the pain then begins to diminish, and is less constant; it becomes more dull, and is principally confined to the

region of the antrum. The teeth of the affected side cease to ache, or ache only at times, but still remain sensitive to the touch. The mucus membrane of the nostril next the diseased sinus, is often tender and slightly inflamed, and if the other one be closed in the morning, or after two or three hours sleep, by pressing upon it with the thumb or one of the fingers, and a violent expiration made through it, a thin, watery fluid, of a slightly fetid odor, will be discharged, and pain will be experienced in the region of the antrum.

CAUSES.

The explanation of the causes of inflammation of the pituitary membrane of the maxillary sinus, as given by Deschamps, is far from satisfactory. After stating that it is produced by all those general causes which give rise to it in other parts of the body, he enumerates among what he denominates "peculiar causes," a degeneration of the humor which it pours out, "blows upon the cheek, fractures, wounds, and the extraction of teeth." What he means by those general causes, I am at a loss to understand, except it be certain morbid dispositions of body, irregular exposures to cold, &c. &c. The influence which these exert upon the mucus membrane of this cavity, has been explained in another place; it will therefore be unnecessary to repeat what has already been said concerning them, except it be to state that they first exercise the same influence upon the membrane in other parts of the body that they do here, and that this consists, not in actual disease, but only in an increase of excitability. The exciting cause of inflammation of this cavity, is local irritation, and, a degenerated condition of its secretions, blows upon the cheek, wounds, and the extraction of teeth, may be enumerated among the agencies which are sometimes concerned in its production.

Boyer says, "This inflammation may be produced by a blow upon the cheek, by small-pox, measles," &c. but the most ordinary cause is earies and pain in the teeth. The two last, although not mentioned by Deschamps, are very frequently concerned in the production of this affection. All morbid conditions of the teeth and gums, that give rise to irritation in the alveolar periosteum,

teal tissue, may be regarded as among the most frequent of its exciting causes. Of the affections of the teeth that do this, caries, necrosis, and exostosis may be mentioned; also, loose teeth, and the roots of such as have been either fractured in an attempt at extraction, or by a blow or fall, and left in their sockets; or that have remained after the destruction of their crowns by decay. It sometimes happens too, that inflammation is excited in this membrane by fractured alveoli; but when an accident of this sort occurs, the detached portions of bone are generally soon thrown off by the operations of the economy, and the cause being removed, the inflammation immediately subsides. Not so with the roots of teeth. They often remain concealed in their sockets for years, except they be removed by art. Nature, it is true, makes an effort to expel them from the jaw, but this is accomplished only by a slow and very tedious process, and not, in many instances, until they have given rise to some serious affection. But, of the deleterious effects that result from roots of teeth in the alveoli, it is not necessary now to speak; as extraneous bodies, they are always productive of more or less irritation.

As to the influence which diseases of the gums exert upon the alveolar periosteum, suffice it to say, that it is little, if any less hurtful than that resulting from the affections of the teeth. Disease here is very certain to communicate itself to that membrane. It is, in fact, to the morbid affections of this structure, that diseases of the alveoli are most frequently attributable. It is true, diseases of the gums, do not often give rise to acute alveolar periostitis, but they excite in the lining membrane of these cavities, a chronic inflammation, which, if not arrested, sooner or later eventuates in their destruction, and as a consequence, to the gradual loosening, and ultimate loss of the teeth.

Thus it may be perceived, how very liable the periosteal tissue of the alveolar cavities is to become inflamed; and, inflammation having been excited here, how very easy it is for it to extend itself to the maxillary sinus. That it often propagates itself to this cavity, no one, I should suppose, could doubt. We are not left to mere conjecture, or doubtful inference, in regard to this matter. Not only is inflammation more frequently traceable

to alveolo-dental irritation, than to any other cause, but every other form of disease to which this cavity is subject. The truth of this assertion is established by the result of the treatment of cases which I shall hereafter notice.

Having said thus much concerning the causes of inflammation of the lining membrane of the antrum maxillare, I shall now proceed to describe its remedial indications.

TREATMENT.

The curative indications of the affection under consideration are simple, and for the most part, similar to those of inflammation in other parts of the body. "Bleeding from the arm, feet, pediluvia, antiphlogistics, mild purgatives, emollient cataplasms, anodyne applications to the cheek, fumigations to the nose, by means of an inverted funnel," says Deschamps,* are the means usually employed. Originating, however, as does most frequently, inflammation of the lining membrane of the maxillary sinus, from the irritation produced by decayed, dead, or loose teeth, the removal of these, will, in most cases, be all that is necessary to accomplish a cure. This is the practice which Boyer recommends,† and Deschamps says, "it is not uncommon for the disease to cease immediately after the extraction of an affected tooth." When the inflammation is severe, its reduction will be expedited by bleeding from the arm, saline purgatives and fomentations to the face. In many cases, great benefit will be derived from the application of leeches to the cheek, as recommended by Mr. Thos. Bell. I have known the most decided advantage to result from their employment. When the disease is dependent, as in most instances it is, upon an unhealthy condition of the alveolar processes, the first thing to be done, is to remove all such teeth, or roots of teeth, as are productive of the least irritation, for, while any local sources of irritation are permitted to remain, neither topical or general bleeding, or any other treatment, will be of permanent advantage.

* Vide, *Maladies des Fosses Nazales*, sec. 2, Art. ii. p. 238.

† Vide, *Maladies Chirurgicale*, tom. vi. page 139.

The treatment of inflammation of this cavity, however, may be best illustrated by the following cases, which, from very many similar ones that have fallen under the author's notice, he will briefly narrate.

CASE 1st. In the spring of 1840, W. H., æt. nineteen, of a sanguino-scorbutic temperament, called to consult me concerning a deep-seated pain, which he had felt, for more than two months, in his left cheek. On interrogating him, I ascertained he had occasionally, during this time, discharged a fetid matter from the nostril of the affected side. For the relief of the pain in his cheek, leeches and anodyne fomentations to the face, and purgatives had been prescribed, but from these he obtained only temporary relief. At length, his medical attendant, suspecting the affection was in some way connected with his teeth, which were in a very unhealthy condition, advised him to obtain my opinion with regard to the agency they might have in its production.

The first and second molares, the third not having yet appeared, and the two bicuspidæ, on examination, I found so much decayed, as to render their restoration to health impossible. Abscesses had formed in the sockets of the first bicuspid and second molaris, and the matter from which was almost constantly discharging itself from fistulous openings through the gum beneath the upper lip and cheek. Both the bicuspidæ and molares of this side were sensitive to the touch, and the gums around them were in a spongy and inflamed condition.

Not being able to institute any treatment that would be of service to his teeth, and convinced that the affection of his cheek was attributable to the irritation which they produced, I advised their immediate extraction, to which operation he at once submitted. Four weeks afterwards, he called and informed me the pain in his cheek subsided about ten days after the removal of his teeth, and had not since returned.

CASE 2d. Mrs. L——, æt. about twenty-seven or eight, of a scrofulous habit, had been at times affected, for more than two years, with a deep-seated pain in the right side of her face, midway between the orbit and alveolar ridge; and on closing the left

nostril, and making a violent expiration through the right, discharged a slightly, yet perceptibly fetid mucous matter, which occasionally excoriated the mucus membrane lining this cavity of the nose. The pain, from the fact that it was most severe in cold and damp weather, was thought to be rheumatic. General and local bleeding, fomentations, mustard plasters, purgatives, anodynes, tonics, and many other remedies had been in vain employed.

A severe paroxysm of tooth-ache about this time, July, 1841, more than two years subsequently to the time when she first felt the deep-seated pain in her cheek, induced her to apply to me for my professional services. On examining her mouth, the crowns of the second molaris, dens sapientia, and first bicuspid of the affected sides were found to be destroyed by caries; the gums covering the sockets of their roots were inflamed and very sensitive. It was the roots of the wisdom or third molar tooth that ached, and for the alleviation of the pain of which, she had called upon me. Extraction being the only remedy that held out the least prospect of relief, I at once proposed that operation, and at the same time urged upon her, the importance of having the roots of the second molaris and first bicuspid removed. A great deal of persuasion however, was necessary to obtain her consent, she being of an exceedingly nervous and timid disposition; but having made up her mind to submit to the operation, she determined to have it immediately performed. She had no cause to regret their removal, for not only was she freed from the annoyance which they occasioned to her tongue, gums, &c., but the operation was likewise followed by a speedy subsidence of the pain in the cheek, and a cessation of the fetid discharge from the nose.

CASE 3d. In December, 1841, I was consulted by Mr. S. M. J——, twenty-three years of age, and of sanguinous disposition. He had been affected for several months, with a dull heavy pain, which as he said, seemed to be seated deep in his right cheek, and as in the case last described, a fetid mucous matter was discharged from the nostril of the affected side, on making a violent expiration through it, with the other nasal cavity closed. His teeth, to all appearance, were perfectly sound, but the gums

around the first and second bicuspidés and first molaris, were inflamed, spongy, and slightly ulcerated between their edges and the necks of the teeth; from which, they had separated to the edges of the alveoli. These morbid phenomena, he attributed to a blow, which he had received from a fall, upon these teeth about two years before. It was immediately followed by pain, inflammation, and in about two months, the exfoliation of several small portions of the alveolar processes, which came out through the gum. These were the only unpleasant effects which he experienced at the time, but there was always afterwards, a slight soreness in the teeth, that had received the injury. This, as he informed me, gradually extended itself higher and higher into the substance of the jaw, until, about four months previously to his having called on me when its place seemed to be taken by the kind of pain first described; and soon after the fetid discharge from the right nostril was discovered.

That the deep-seated pain in the right superior maxillary, was occasioned by inflammation of the mucus membrane which lined its sinus, I could not doubt, and that this had resulted from the alveolar irritation, caused by the violence that had been inflicted upon the first and second bicuspidés and first molares, to me, was equally evident, and under such circumstances the removal of the injured teeth seemed to constitute the proper curative indication, I therefore, proposed their extraction, which operation he immediately submitted to. Three weeks after, the pain in his jaw had entirely disappeared.

I could mention a number of similar cases, where the pain and other inflammatory symptoms, have been relieved simply by the removal of decayed and dead teeth. When the inflammation is dependent upon the presence of these, and that it is in a large majority of cases there can be no question, their extraction will suffice in nearly every instance, to effect a cure. When it has been produced by any other cause, as for example, a sudden exposure to cold, a blow upon the cheek, fractures of the alveoli, &c. &c. then the application of leeches to the gums and cheek, fomentations, bleeding from the arm, purgatives and other treatment may be called for.

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This affection, as is remarked by Boyer, would be of little consequence, were it not that it is liable to give rise to other and more dangerous forms of disease, such, for instance, as a purulent condition of the secretions of this cavity or an engorgement of it. It should never therefore, be permitted to continue, but should be as speedily arrested as possible; and for the accomplishment of this, the means here pointed out, will, if timely and properly applied, be found fully adequate.

Inflammation of the pituitary membrane of the maxillary antrum, sometimes causes the opening into the nose to become closed, and when this happens, an engorgement of the cavity is certain to result. Various other morbid phenomena also occasionally arise from it, but the most common form of disease, resulting from it, is an altered or purulent condition of the mucous secretions of the cavity. This I propose next to notice.

CHAPTER THIRD.

PURULENT CONDITION OF ITS SECRETIONS, AND ENGORGEMENT.

PURULENT condition of the secretions of the maxillary sinus and mucous engorgement, are indiscriminately, though very improperly, denominated by most writers on the affections of this cavity, abscess. To this, neither bears the slightest resemblance. Deschamps treats of the former under the name of suppuration, and the latter dropsy. In speaking of the first he tells us, "if after the time of the inflammation has passed, the surrounding parts cease to be painful, while the affection still continues to cause pain in the antrum, and the fever, though diminished, occurs at irregular intervals, and if the inflammation is followed by a pulsating pain, we will have reason to suppose that an abscess has formed in the sinus; and," he continues, "all doubts will be removed, if on the patient's inclining his head to the opposite side, matter is discharged into the nostril, or if some tubercles are formed near the outer angle of the eye, or alveolar border, which last happens more frequently; and finally, if the purulent matter not finding any opening through which to evacuate itself, distends the sinus to such an extent as to form a tumor outwardly upon the cheek." In short, all the symptoms which he mentions as belonging to the disease, are those accompanying the one under consideration. The matter he says is of a "putrid serous consistency."

Bordenave has fallen into a similar error. He terms an altered state of these secretions, suppuration of the membrane, and tells us that inflammation is not necessary to it. He seems to have confounded in alveolar abscess those cases where the matter, instead of evacuating itself as it ordinarily does, by an opening which it makes for its exit through the alveolus and gum into the

mouth, escapes into the antrum, with abscess of that cavity. Again, he asserts that the disease, (suppuration as he calls it) may be independent of the surrounding parts, and although ordinarily implicated with an altered condition of them, he affirms, it is sometimes the effect of disease primarily seated in this cavity.*

There is no doubt a purulent condition of the fluids of this cavity is often complicated with ulceration of the lining membrane, but that the affection is at all analogous to abscess or suppuration, its very nature and situation, is sufficient to disprove. "A reference to the structure of the antrum," says Mr. Bell, "would appear to be sufficient to point out the improbability, to say the least, of the occurrence of abscess in such a situation. That a mucus membrane covering, in a thin layer, the whole internal surface of such a cavity, should become the seat of all the consecutive steps of true abscess, is a statement bearing on the face of it an obvious absurdity."† Notwithstanding the seeming improbability of such an occurrence, and it is certainly one that very rarely happens, abscess does nevertheless sometimes seat itself in this cavity; but, it is a different affection altogether from that usually treated of under that name. I have already adverted to a case narrated by Mr. B., a description of which, I intend hereafter to give.

When complicated with ulceration of the mucus membrane;—and it is probable that a purulent condition of the secretions of this cavity, in most instances is thus complicated;—the affection is precisely analogous to ozena, and, by many of the older writers, is designated by that name. Mr. Bell describes it, and very properly too, as being similar to gonorrhœa—both diseases equally consisting of an altered secretion, in the one, of the pituitary membrane, and in the other of the mucous lining of the urethra, which, in neither instance, possesses any of the characteristics of abscess, though the matter in both is purulent.‡

It has been before stated that the obliteration of the nasal opening was more frequently an effect than a cause of disease in

* Vide *Memoirs de l'Academie Royale de Chirurg.* vol. 12, p. 8. 12mo.

† *Anat. Phys. and Diseases of the Teeth*, page 253.

‡ *Anat. Phys. and Diseases of the Teeth*, page 254.

the maxillary sinus; it does, however, sometimes become closed, from other causes than an unhealthy condition of this cavity, and when this happens, an engorgement of the sinus is the inevitable consequence. The fluids thus accumulated are not always at first purulent. They may become so, by their retention in the cavity, and, when the closing of the opening is the result of previous disease in the antrum, the secretions are more or less altered from the very first.

The accumulation of the secretions of the antrum, whether in a healthy or purulent state, is a constant source of irritation to the lining membrane, and the pressure which they ultimately exert upon the surrounding walls, causes a new form of diseased action to be set up, that not unfrequently involves all the bones of the face as well as those of the base of the cranium, and which, if not soon arrested, ultimately destroys the life of the patient. When prevented from escaping through the nasal opening, they eventually make one by which to evacuate themselves. This is sometimes effected through the cheek, at other times beneath it, just above the alveolar ridge, or through the palatine arch or alveoli down by the sides of the roots of one or more of the teeth, and thus establish a fistula, from which a fetid matter will be almost constantly discharged. From openings of this sort, the matter is sometimes evacuated for years, while the disease in the antrum, in the meantime, very frequently, does not seem to undergo any apparent change. At other times the membrane ulcerates and the bony walls become carious.

A purulent condition of the mucous fluids of this cavity, independently of caries of the bone, or even of simple fistulous openings, is an exceedingly troublesome and unpleasant affection. The odor from the matter is of itself, often very annoying even to the patient, and when the secretions are retained for some days in the sinus before they are evacuated, the feter from them is sometimes almost insufferable.

In good constitutions, the secretions, of the antrum, are not so liable to become purulent, though they be confined for a long time in the cavity. It is only in scrofulous, scorbutic, or debilitated habits they are liable to become thus altered. Inflamma-

tion of the lining membrane, (the immediate or proximate cause,) may exist for years without giving rise to it. The differences in the effects produced upon them, and the surrounding parts, by inflammation of this membrane is owing to the differences in the state of the constitutional health of those affected by it.

Where a puriform state of the secretions of the cavity is complicated with ulceration of the membrane, the matter will have mixed with it a greater or less quantity of flocculi, sometimes of so firm a consistence, as to block up the nasal opening, and prevent its exit. Mr. Thos. Bell says, he has seen more than one case in which a considerable accumulation had taken place in the antrum, accompanied by the usual indications of this affection, (muco-purulent engorgement of the sinus) when a sudden discharge of the contents into the nose, took place, "in consequence of the pressure having overcome the resistance which had thus been offered to its escape."* Cases of a very similar nature have fallen under my own observation, the history of some of which may be given in the course of this essay. The formation of these flocculi rarely cease, except with the cure of the ulcers of the membrane. They give rise to considerable irritation, and their presence always constitutes an obstacle to the cure. They are usually easily removed by injections.

The pituitary membrane of the antrum when in a healthy state, secretes, as I have before stated, a transparent, slightly glutinous and inodorous fluid, which is poured out only in sufficient quantities to lubricate the cavity. No sooner is inflammation excited in the membrane, than its secretions become more abundant, and, at first thinner, afterwards thicker and more glutinous.† Their colour and consistence are not always the same. Instead of being transparent, they sometimes have a dirty opaque appearance; at other times they assume a greenish, whitish or yellowish colour, and in some instances they bear a considerable resemblance to pus, which, it has been conjectured, might be owing to a suppuration of some of the mucous follicles of the lining membrane of

* Vide, *Anat. Phys. and Diseases of the Teeth*, p. 258.

† Vide, *Maladies Chirurgicales*, tom. vi. p. 140.

the antrum, and a consequent mixture of pus with its secretions. Mr. Thomas Bell, however, inclines to the opinion that it is attributable to an "alteration simply" of the secretions of the cavity. But their colour and consistence, I am disposed to believe, are determined by the degree of inflammation, the length of time it has existed, the state of the health of the lining membrane, and that of the surrounding osseous walls, the egress which the matter has from the sinus, and the general habit of the body.

Mucous engorgement of the maxillary sinus and purulent accumulations, it has been remarked, are more common to young subjects than to middle aged ones, or persons in advanced life. An eminent French writer says, that of three individuals affected with dropsy (mucous engorgement) the oldest was not twenty years of age.* Although these affections are more common to young persons than individuals of advanced life, they are by no means confined to the former. Debilitated habits, of every age, are subject to them.

SYMPTOMS.

The diagnostics of the several affections of the antrum, as has been intimated in a preceding place, are so much alike, that it is often difficult to distinguish those that belong to one from those attendant upon another. The symptoms of mucous engorgement and purulent accumulations, however, are generally such, as will enable the practitioner to distinguish, with considerable certainty, these affections from others that are here met with. They are always preceded by inflammation of the lining membrane; a description of the signs of which, having already been given, need not be repeated. Omitting these, I at once proceed to mention those by which they are accompanied.

In speaking of those which more particularly belong to a purulent condition of the secretions of the antrum, Deschamps says,

* Vide, *Traite des Maladies Chirurgicales et des Operations qui leur conviennent*, tom. vi. p. 139.

the affection may be distinguished by a dull heavy pain, extending along the alveolar border. Upon this symptom alone, little reliance can be placed, as it is always present in chronic inflammation of the pituitary membrane of this cavity. In addition to this, he mentions the presence of decayed teeth, soreness in those that are sound, and on the patient's inclining his head to the side opposite the one affected, the discharge of fetid matter from the nose. These are certainly very conclusive indications of purulent effusions in this cavity. Bordenave, after enumerating the symptoms indicative of inflammation, mentions the following as belonging to the affection of which I am now speaking; viz. dull and constant pain in the sinus, extending from the maxillary fossæ to the orbit; a discharge of fetid matter from the nose, when the patient inclines his head to the opposite side, or when the nose is blown from the nostril of the affected side.* These are symptoms which are mentioned by almost every writer upon the subject, as indicative of a purulent condition of the secretions of the maxillary sinus.

The diagnostics indicative of engorgement, differ materially from those which denote simply a purulent condition of the mucous secretions of this cavity. The pain instead of being dull and heavy, as just described, becomes acute, and a distressing sense of fullness and weight is felt in the cheek, accompanied by redness and tumefaction of the integuments covering the antrum.† The nasal opening having become closed, the fluids of the cavity gradually accumulate until they fill it, when, finding no egress, they press upon and distend the surrounding osseous walls, causing those parts which are the thinnest ultimately to give way. The effects are generally first observable anteriorly beneath the malar eminence, where a smooth hard tumor presents itself, covered by the mucus membrane of the month. But this is not always the point which first gives way, the sinus sometimes bursts into the orbit, at other times outwardly through the cheek, or through the palatine arch. The long continued pressure that is thus exerted upon the bony walls of this cavity, often cause

* Vide, *Memoirs de l'Academie Royale de Chirurgie*, 12mo. tom. 12, p. 10.

† Vide, *Bell on the Teeth*, p. 256, see also *Maladies des Fosses Nazales*, p. 228.

them to become softened, by the destruction of their calcerous molecules.

The tumor which is at first hard, in a short time becomes so soft as readily to yield to pressure. A distention of the maxillary sinus, Deschamps says, may be distinguished from other diseases that affect the skin or intermediate structure between it and the bone, by the uniformity or regularity of the tumor, its firmness at the commencement, the slowness with which it progresses, and above all, by the natural appearance of the skin, and the absence of pain when pressure is made upon the tumor. An obliteration of the nasal opening, he says, may be suspected by the dryness of the nostril of the affected side, the mucus membrane of which becomes thickened, and the cavity contracted; inflammation and sponginess of the gums, loosening, and sometimes, (in consequence of the destruction of their sockets,) displacement of the teeth, may also be mentioned as occasional accompaniments of engorgement of this cavity.

CAUSES.

On the causes of this, in common with the other affections of the maxillary sinus, I have before spoken; it will not, therefore, be necessary to say much in this place concerning them. It may be well, however, to repeat, that the secretions rarely become purulent in individuals possessed of good constitutional health, so it would seem, that although local irritation be necessary to it, this is capable of producing it only in those labouring under a bad habit of body, or in whom there exists a tendency to such alteration. Inflammation of the lining membrane, no matter how produced, is the immediate cause, and this, as has been before shown, results more frequently from alveolo-dental irritation, than from any other cause. I am not the only one of this opinion;—it is maintained by almost every writer upon the morbid affections of this cavity. The teeth most frequently concerned in the production of irritation in the lining membrane of the antrum, are the first and second molares, but the *bicuspidæ* and *dentes sapientiæ*, do sometimes cause it. It being conceded by nearly every one that the exciting cause of all the diseases of this cavity, is dental irritation, I need not spend time in recapitu-

lating what has before been said upon this subject, or in controverting absurd and erroneous opinions.

Engorgement of the sinus is attributed to several causes, among which, are blows upon the cheek, caries of the teeth, &c. &c. But, whatever may be the exciting or primary causes of this affection, it is certain that the proximate or immediate cause, is the closing or obliteration of the nasal opening. This, like purulent secretion, may be produced by inflammation and thickening of the lining membrane of the sinus, which is, perhaps, the most frequent cause.*

TREATMENT.

The curative indications of muco-purulent secretion and engorgement of the maxillary sinus are, 1st, If the nasal opening be closed, the evacuation of the retained matter; 2dly, The removal of all local and exciting causes of irritation; 3dly, and lastly, the restoration of the lining membrane.†

For the fulfilment of the first, an opening must be made into the antrum, and this should be effected in that part which will afford the most easy exit to the retained matter; but as it regards the several methods that have been proposed for the accomplishment of this object, practitioners differ; before I proceed further, it may not be amiss to notice some of the various methods that have been adopted.

Dr. Drake, an English anatomist, and author of a work entitled “*Anthropologia Nova*,” has the credit of being the first to propose a plan for the evacuation of accumulated fluids from this cavity, and the method adopted by him for effecting this object, consists in the extraction of a molar tooth and the perforation of

* Fouchard says, in the Anatomical Mus. of the University of Copenhagen, he saw caries of the bones of the face produced by a molar tooth, the crown of which having turned outwards, had penetrated the maxillary sinus. *Mem. de l'Academie de Chirurg.* vol. v. mem. 257. Also the fangs of the bicuspidés and front molaris sometimes penetrate the sinus. Bertin *Osteologie*, vol. xi. p. 309.—Portal *Camp. d'Anatomie Medicale*, vol. i. p. 210. Note 2.—My *Uerzeichniss*, No. 3278; there are in the Bresl. Mus. No. 8128, two teeth, as it were absorbed, which had been drawn out of the maxillary sinus.—*Otto's Compend. of Comp. Anat.*

† Vide *Anat. Phys. and Diseases of the Teeth*, p. 259.

the sinus through the alveolus of one of its roots. This method of treatment however, is said by some to have been inserted into Drake's anatomy by Dr. Cowper, an eminent anatomist and surgeon.* Having never seen any evidence touching the correctness of this conjecture, I suppose, its truth is probably somewhat questionable. M. Gûnz says the credit belongs to John Henry Meibomius, who a long time before proposed a very similar method of treating these affections.† Henry Meibomius, many years after the death of his father John Henry, proposed for the evacuation of accumulated fluids in the antrum, the extraction of one or several teeth.‡ But, the perforation of the maxillary sinus through the alveolus of a molar tooth, is said not to be the most ancient method. Molinetti, as early as the year 1675, describes an opening made through the cheek into the antrum, the wall of which, after having been exposed by a crucial incision through the integuments covering it, was penetrated with a trephine. And, the perforation of this cavity through the alveolus of a superior molaris, is an operation which, according to Velpeau, was performed by Zwinger a long time before it was performed by Meibomius; and Vanuessen, says, Ruysch, extracted several molares and cauterized their sockets, for the destruction of a polypus, until an opening was made into the antrum large enough to admit the finger. Drake, according to Bordenave, seems, nevertheless, to be entitled to the credit of having been the first to perforate the maxillary sinus through the alveolus of a molar tooth, by means of a punch, for the evacuation of accumulated fluids, and the injection of the cavity. We are also informed by the same author, that Cowper treated a case of maxillary ozena, which had caused a large quantity of ichorous and fetid matter to be discharged through the nose, by extracting the first molaris and perforating the antrum through the alveolus with an instrument suited to the purpose.

It is not at all probable that Meibomius was the first to propose the perforation of the antrum through the alveolus of a molar

*Heister's Surgery, note to chapter 72, p. 445.

† Vide, Mem. de l'Acad. Royale de Chirurg. 12mo. vol. xii. p. 12.

‡ Vide, Discurs. de Abscessibus internis, Dresd. 1718, p. 114, and la Dissertation d'Gunz.

tooth, for his researches were not published until 1718, twenty-one years after the publication of Drake's system of Anatomy, and besides, he regarded the perforation of this cavity as a dangerous operation, and on that account, confined himself simply to the extraction of a tooth. Saint Yves, says Velpeau, treated with success, a person affected with fistula, the floor of whose orbit had been destroyed, by the removal of a tooth.

With regard to the tooth most proper to be extracted, authors differ. Cheseldon preferred the first or second molaris, Junker recommends the extraction of the first or second bicuspidæ, and if a fistula had formed, to enlarge it instead of perforating the floor of the antrum. It is at present pretty generally conceded that the second molaris, it being directly beneath the most dependant part of the cavity, is the most suitable tooth to be removed. If this be sound, the first molaris, dens sapientiæ, or either of the bicuspidæ, if carious, should be extracted in its stead, and in fact, none of the teeth in an unhealthy condition should be permitted to remain.

An opening having been effected through the alveolus of a tooth into the antrum, it should be kept open until the health of the cavity is restored. For this purpose, sounds and bougies adapted to the purpose have been introduced. Heuerman, recommends the employment of a small canula, which is also preferred by Bordenave and Richter, the latter of whom says, it should be kept closed to prevent particles of food from getting into the sinus. But, whether a canula or bougie be introduced into the opening, it should be so secured as to prevent it from coming out or passing into the antrum. Deschamps recommends that it be fastened to one of the adjoining teeth by means of a silk or metallic ligature.

Lamorier, an eminent surgeon of Montpellier, recommended perforating the antrum immediately above the first molaris, or rather between it and the malar bone. In this, he seems to have been influenced by the consideration that the wall of the cavity here, presents the least thickness, and that this is the most dependant part of the sinus. If a fistulous opening had previously formed in some other place in the mouth, he did not always deem it necessary to make another. His method of operating is as follows. The jaws being closed, the commissure of the lips are drawn outwards and slightly upwards with a curved instrument, called a

speculum; this done, the gum is incised across the malar apophysis, or maxillo-labial sulcus, and the bone made bare, which is next pierced with a spear-pointed punch. The opening is afterwards enlarged if found necessary.

Desault is of the opinion that the opening should be made through the canine fossa, beneath the upper lip, and for that purpose, after having laid bare the bone, he employs a sharp triangular and a blunt-pointed perforator, which he invented for the operation. Runge, says Velpeau, used nothing but a scalpel. Mr. Charles Bell invented a trephine for the purpose, but this, it is thought, does not possess any advantage over the instruments employed by Desault and Runge. In cases of fistula in the cheek from the antrum, Ruffel advises the insertion of a trocar, to be carried through the gum, so as to form a counter opening. Through this, in a case which he treated, he passed a seton, and it remained six weeks; at the expiration of this time, a cure was accomplished. This practice has been followed by Callisen, Zang, Busch, Henkle, Brandi, Faubert and others. Callisen is of the opinion that when the tumor points in the palatine arch and fluctuation is felt, the artificial opening should be formed there. Gooch, says Velpeau, in a case which he treated, advised the perforation of the antrum through the nasal surface, and fixing in the opening a canula of lead. We are also informed by the same author, that, Acrel, after having operated in the manner proposed by Cowper, inserted a second canula into the sinus through a fistulous opening formed in the nose. The method attributed to Wienhold, consists in penetrating the sinus from the upper and external part of the canine fossa, with the instrument directed obliquely downwards and outwards, so as to avoid the branches of the infra-orbital nerve; and then placing in the opening thus made a little lint. Weinhold, directs, that when the antrum has no other opening, the instrument should be carried entirely through the palatine arch, and then by means of a curved needle and thread, he introduces a roll of lint, saturated or covered with some appropriate medicine, and this he designs to act as a seton.

Velpeau says, the perforation is effected "in the point of election or of necessity. The first varies according to the ideas of

the operator. The circumstances, on the contrary, determine the second. In cases of abscess, dropsy, fistula, and ulceration, the operation is almost always performed in the place of election. Then, provided one of the molar teeth be unsound, it must be extracted, together with the adjoining tooth; the gum is then to be cut down to the bone, externally; internally, behind and before, forming a kind of a square flap, and to be completely detached from the surrounding tissues; after this the alveoli are to be perforated with the instruments of Desault, and an opening made large enough to admit the finger into the sinus." For the evacuation simply of purulent mucus, or accumulated fluids, I believe with Boyer, that the opening should always be made from beneath; and, I am the more convinced of the importance of giving the alveolus of an extracted tooth the preference, from the consideration that it is to the irritation produced by some one or more of these organs, that this affection is attributable. Even though a fistula may have been formed above the alveolar ridge, beneath the cheek, or in the palatine arch, we should not neglect to extract such teeth, whether carious or sound, as may be productive of irritation. It may not always in such cases be necessary to perforate the sinus from the socket of a tooth, though the cure in most instances would be expedited by it.

Jourdain, an eminent French dentist, and graduate in surgery, instead of seeking egress for matter accumulated in the maxillary sinus, by any of these methods, proposed, in a memoir which he presented to the academy in 1765, to probe the cavity by its natural opening, and then by suitable injections to restore it to health. The academy gave this proposition its attention; it was carefully and minutely discussed. The practicability of obtaining entrance into the sinus in this way was called in question; it was contended that the difficulties presented by the peculiar structure of the parts were such that they could seldom be overcome; but to remove all doubt upon the subject, a trial was determined on.

While this subject was before the academy, M. Allouel, Jr. claimed the credit of the discovery for his father, who, he said, made it in 1737, and treated with success in 1739, a case of disease in the antrum by injecting it through the natural opening.

But, the academy determined that inasmuch as M. Allouel had never published it, Jourdain could not have borrowed it from him, and was therefore entitled to the credit of being the discoverer. It is certain that he was the first to announce it to the world.

The instruments employed for probing and injecting the sinus are, says Bordenave, 1st, a small silver sound with a button on one end, and a plate in the form of a heart at the other, to be held between the fore-finger and thumb of the operator: 2d, a hollow sound without either button or plate, containing a stilet of whale-bone, with its extremity extending beyond the sound between the fingers: 3d, a small syringe, with a pipe adapted to the hollow sound. The two first instruments should be curved something like the letter S, and vary a little in size.

The treatment of affections of the maxillary sinus by injections through the nasal opening, having been almost entirely abandoned, a more minute description of the instruments employed for the purpose is not deemed necessary. It may be well, before dismissing this part of the subject, to state that the academy, when this method of treatment was proposed by Jourdain, at once appointed commissioners to investigate its merits, who, after having made a number of trials, came to the conclusion that the introduction of a sound by the nasal opening, although perhaps possible, was so exceedingly difficult, that it could seldom be effected. They attempted it upon each antrum of five subjects, and the result proved that the sound pierced the membranes between the turbinated bones more frequently than it entered the sinus by the natural opening. Their report was therefore unfavourable, and Bordenave in remarking upon this method of gaining access to the cavity, states that while the membranes between the ethmoidal and inferior turbinated bones may be pierced without causing serious injury, it induces us when it happens, to suppose that we have entered the sinus by the natural opening, which "goes to prove that the operation is as difficult as it is uncertain." He adds, however, that while there are cases in which the use of injections through the natural opening will suffice to effect a cure, these would succeed in only a very small number of the cases,

inasmuch as these diseases result more frequently from morbid conditions of the teeth than from any other causes.

The only advantage then, as is justly remarked by the last named author, that is derived from injections, is the cleansing of the membrane of the antrum, or the disgorgement of the cavity, and this, while the cause remains, will not suffice to effect a cure, while the removal of that, and the giving of vent to purulent or accumulated fluids will of themselves, in most instances, be all that is required to bring about a healthy action. The cure, no doubt, will many times be greatly facilitated by the employment of suitable injections, but that these exercise as great a curative influence as many imagine, I have yet to be convinced. They may in those cases where a morbid action has been kept up so long in the mucus membrane of this cavity, as to have nearly destroyed its power to re-act, be highly serviceable, but the difficulty of doing this through the natural opening, as is shown by the result of the experiments of the commissioners appointed by the French Academy, and those of others who have attempted it, is such as must forever preclude their introduction in that way.

Moreover, M. Allouel and Jourdain, who have attempted to establish the efficacy of injections, by the citation of cases, seem to have overlooked the agency which the removal of the causes, during the employment of the injections, had, in bringing about the cure; so that arguments advanced by them in favour of their method of treatment do not prove any thing in its favour. "They might," as Bordenave justly observes, "just as well have been cured without as with them." Boyer, in alluding to the method proposed by Allouel and Jourdain, asserts that it is opposed both to reason and experience. It is also condemned by almost every writer upon the diseases of this cavity.

When the natural opening is closed, the first indication, as has been stated, is the evacuation of the matter, and for this purpose, a perforation should be made into the sinus, and the most proper place for effecting this, it has been shown, is through the alveolar cavity of the second molaris.* It may however be penetrated

* Vide, Anat. Phys. and Diseases of the Teeth, p. 261.

from that of either of the other molares or bicuspidés. The perforation, after the extraction of the tooth, is made with a straight trocar, which will be found much more convenient than those usually employed for the purpose. The point of the instrument after having been introduced into the alveolus, through which it is intended to make the opening, should be pressed against its bottom in the direction towards the centre of the antrum. With the handle of the instrument in the hand of the operator, a few rotary motions will suffice to pierce the intervening plate of bone. If the first opening be not sufficiently large, its dimensions may be increased to the necessary size, by means of a spear-pointed instrument. In introducing the trocar, care should be taken to prevent a too sudden entrance of the instrument into the cavity. Without this precaution, it might be suddenly forced into it and against its opposite wall. The entrance of it is usually attended with a momentary severe pain, and its withdrawal followed by a sudden gush of fetid mucus.

It is not always necessary to perforate the floor of the antrum after the extraction of a tooth; it occasionally happens, as has already been remarked, that some of the alveolar cavities communicate with it.

An opening having thus been effected, it should be prevented from closing, until a healthy action shall have been established in the lining membrane, and for this purpose a bougie or leaden or silver canula may be inserted into the opening and secured in the manner previously noticed, to one of the teeth. It should, however, be removed for the evacuation of the secretions of the antrum at least twice a day. The establishing of an opening at the base or most dependant part of the sinus, will, in those cases where a fistula has been previously formed, in most instances, be followed by its speedy restoration. Having proceeded thus far, the cure will be aided by the employment of such general remedies as may be indicated by the state of the constitutional health, and for the reduction of the local inflammation, leeches to the gums and cheek will be found very serviceable. The antrum should, in the meantime, be injected with, at first, some mild or bland fluid, and afterwards with gently stimulating liquids. Di-

luted port wine, a weak solution of the sulphate zinc, and rose water and also that of copper and rose water, have been recommended.* Diluted tinct. of myrrh may sometimes be advantageously employed, and when the membrane is ulcerated, a weak solution of the nitras argentum† will be highly serviceable. For correcting the fœtor of the secretions of this cavity, a weak solution of the chloride of soda or lime, may be injected into the antrum.

DR. ISAAC I. GREENWOOD, an eminent dentist of New York, employed with success in a case of muco-purulent secretion of the antrum, caused by an alveolar abscess, "suds made from tepid soft water and old Castile soap," and he mentions another, treated in the same way by his father, the late Mr. John Greenwood.

In cases of muco-purulent secretion simply, a weak decoction of galls may be injected into the sinus with very considerable advantage.‡

Injections of a too stimulating nature are sometimes employed. This should be carefully guarded against by making them at first very weak, and afterwards increasing their strength as occasion may require; but when symptoms of a violent character are in this way produced, they should be combatted by leeches to the gums and fomentations to the cheek.

But, dependent as these affections in most instances are, upon local irritants, greater reliance is to be placed on their removal, and the giving vent to the acrid puriform fluids in the sinus, than

* The following are the formulæ of Mr. Thomas Bell:

R. Zinci Sulphat, grs. vi.

R. Cupri Sulphat, gr. iv.

Aqua Rosæ, f. ℥ vi. M.

Aqua Rosæ, f. ℥ vi. M.

In addition to the above he recommends the subjoined:

R. Tinct. Myrrh, ℥ i.

Decoct. Hordei, f. ℥ vi. M.

† This should at first be used very weak, say in the proportion of one grain of Nit. Arg. to two ounces of soft water. Its strength, however, may, if necessary, be gradually increased.

‡ **R.** Gallæ Pulv. ℥ ii.

Aqua Font. f. ℥ vi. M.

to any therapeutical effects exerted upon the cavity by injections. As adjuvants, they are serviceable, but a cure cannot be accomplished by them, while the exciting cause remains unremoved. This opinion is sustained by the result of the treatment in the two following cases.

CASE 4th. Mr. W. S——, æt. twenty-four years, of a full habit, and slightly disposed to scorbutis, applied to me in the spring of 1839, to obtain my opinion with regard to an affection of his left antrum. It had existed for nearly a year, and the floor of the sinus had been perforated through the alveolus of the second molaris, which had been previously extracted. Injections, first of diluted tinct. of myrrh, and afterwards of a solution of the sulphate of zinc, diluted port wine, &c. &c., had been used regularly once or twice a day for eight months; but still, the matter that was discharged whenever the opening was unelosed, was exceedingly fetid. It had a thick muddy appearance, and turned silver black almost immediately on being brought in contact with it.

Before the antrum was perforated from beneath, this fetid matter was discharged from the nose, which at first, had induced the belief, that the affection was ozena. The heavy pain daily felt in the cheek, and the occasional sudden discharges of purulent matter from the left nostril, when laying upon his right side, led the medical attendant to suspect that the disease was seated in the maxillary sinus, and for the purpose of introducing what he conceived to be the proper remedies, perforated its floor through the alveolus of the second molaris, as just stated. The operation was immediately followed by a discharge of purulent and very fetid matter.

The use of injections, although persisted in for so long a time, were not productive of any permanent benefit, and the patient almost despaired of a cure. His teeth had been examined, but as none in the left side of the upper jaw appeared to be affected with caries, they were not suspected of having any agency in the production of the disease. On examining his mouth, I perceived, although the teeth were free from decay, they were nevertheless coated with tartar. His gums were inflamed and tumefied; their edges around the bicuspidæ, the first molaris and dens sapientiæ,

were ulcerated, and the alveoli so much wasted that the teeth were considerably loosened, and sensitive to the touch.

Such being the condition of his teeth, gums, and alveoli, the cause of the affection in the antrum, was apparent. That it was attributable to the irritation in the two last, I felt fully convinced, and therefore advised the immediate extraction of the above-mentioned teeth. To this operation, as a dernier resort, he reluctantly submitted. Four weeks after their removal the secretions of the antrum ceased to be offensive, and the opening through the alveolus of the second molaris was permitted to close. The injections that had been previously employed, were continued, but as they had not, previously to the removal of the teeth, exerted any curative effect upon the affection of the maxillary sinus, it is not fair to presume that they did subsequently. It was therefore evidently to the extraction of the teeth that the restoration of the cavity was attributable.

CASE 5th. In the summer of 1840, Mr. B. of a strumous habit, æt. nineteen, applied to me for advice, concerning an affection of the right maxillary sinus, that had troubled him for several months. He informed me that nearly a year before, he had broken the crown of one of his teeth, (the second bicuspid of the affected side,) and that a few weeks after he was seized with a severe throbbing pain in its alveolus. This gradually extended to his cheek, but in the course of a few days, it abated in intensity, though the pain never entirely subsided. About four weeks after the attack, he began occasionally to discharge a glairy and exceedingly fetid mucus from the right nasal cavity. This continued for several weeks, when it nearly ceased, and similar matter was discharged through the root of the tooth that had at first caused the disturbance, which by this time had become funnelled up to its apex, so that a probe could be passed through it into the antrum, from which cavity the matter seemed to come. To prevent the matter from discharging itself continually into his mouth he kept the canal in the root plugged with raw cotton, which he removed two or three times a day to give vent to the accumulated purulent mucus.

Persuaded that the disease of the antrum had resulted from the

inflammation excited in the alveolus of the second bicuspid by the decayed root that was in it, and the abscess had in consequence formed and discharged itself into the sinus, the indication of cure, was too obvious to be mistaken. It consisted in the removal of this local irritant, and to this operation he readily submitted. The muco-purulent discharge without other treatment, soon ceased, the opening through the alveolus closed in about ten days, and he has since remained well.

In the foregoing case, the cure was effected without the use of injections of any kind, and simply by the removal of the root of one tooth, the second bicuspid, which had caused the disease.

The particulars of the following case are obtained from "*Observations of Bordenave on the Diseases of the Maxillary Sinus*,"* a paper embodying reports of forty highly interesting cases.

CASE 6th. "In 1756," says our author, "I was consulted by a lady whose right cheek was tumefied. About a month previous she had experienced acute pain under the orbit of the affected side; and she had felt a pulsation and heat in the interior of the sinus, and the maxillary bone was slightly elevated. These signs determined me to propose the extraction of the third molar tooth,† and the perforation of the antrum through the alveolus. The operation was followed by a discharge of purulent matter, the sinus was afterwards injected, the maxilla gradually reduced itself, and a cure was effected in about two months."

Although injections were employed in the above case, it was no doubt to the giving vent to the matter contained in the antrum the cure was attributable. As it regards the cause that gave rise to the affection in the first instance, not a single word is said. It might have resulted from inflammation, lighted up in the socket of one or more teeth, and propagated from thence to the mucus membrane of this cavity, or from inflammation produced by some other cause, and a consequent obliteration of the nasal opening.

* *Mem. de l'Acad. Royale de Chirurg.* vol. xii. obs. 3, p. 10.

† The bicuspidæ are called by most French writers, molares, and by the "third molar tooth," he means the one which we call the first.

The following brief statement is taken from the history of a case narrated by Fauchard.*

CASE 7th. The child of M. Galois, æt. twelve years, whose first right superior molaris was decayed, had a tumor situated anteriorly upon the upper jaw of the same side, extending up to the orbit. M. Fauchard, supposing this tumor, which was about the size of a small egg, had been caused by the carious tooth in question, determined on its extraction as the only means of accomplishing a speedy and certain cure, and the result proved his opinion correct. The removal of the tooth was followed by a large quantity of yellow serous matter, which on examination was found to have escaped from the antrum. The tumor disappeared soon after the discharge of the matter, and a complete cure was effected.

Bordenave, in noticing the foregoing case, inclines to doubt that the tumor communicated with the maxillary sinus, for the reason that the matter escaped through the alveolus of the first molaris immediately after its extraction. He, however, admits that the acumen and knowledge of Fauchard, are such as to have prevented deception in the case. Admitting then the statement to be correct, and surely the circumstance mentioned by Bordenave does not in the least tend to invalidate it, for it is of frequent occurrence, a cure is effected simply by the removal of a decayed tooth, to the irritation produced by which, the disease was undeniably attributable. The two following cases are described at length by the last named author in the "*Memoirs de l'Academie Royale de Chirurgie*."†

CASE 8th. A woman in 1731, had the first superior molaris, the crown of which had been destroyed by caries, extracted. Not many days after the operation, she was attacked with a pain in the upper jaw that extended from the maxillary fossa to the orbit. The pain was so great as to deprive her of rest, but there was no tumefaction of the cheek or gums. An opening through the alveolus into the sinus was discovered, into which a probe

* *Le Chirurgien Dentiste*, tom. i. obsv. 8, p. 483.

† *Vide*, vol. xii. 12mo. observations 5 and 6, pages 12 and 19.

was introduced by a surgeon. The withdrawal of this was followed by a discharge of yellow fetid matter. M. Lamorier, who was afterwards consulted, removed from the opening a tooth that had been thrust into the antrum and prevented the egress of the matter, by which its retention had become purulent. Injections were employed, a part of which, at the expiration of thirty days, escaped from the nasal opening. A perfect cure was soon after effected.

In this case, the affection of the sinus, was evidently the result of the injury inflicted upon the socket of the first superior molaris in an attempt at the extraction of the tooth. Inflammation was excited by this and the presence of the tooth that had been thrust into the antrum, which extended itself to the lining membrane of this cavity, and caused a temporary obliteration of the nasal opening, so that to effect a cure it was necessary to obtain free vent for the retained matter. In restoring a healthy action to the mucous membrane of the cavity, the injections may have been serviceable.

CASE 9th. A girl, æt. twenty-six years, in having a decayed and painful superior dens sapientiæ on the right side extracted, the tooth was broken and all the roots but one were left in their sockets. These caused an abscess to form, and this was followed, for a short time, by a subsidence of the pain; which however soon returned, and a dull heavy sensation was felt in the antrum of the affected side. From thence the pain extended to the eye and ear. The gums at length became tumefied, and the pain less constant; the patient, although five teeth were in the meantime extracted, remained in this condition for five years. At this time, 1756, M. Beaupreau, who was consulted, found on examination, that the gums where the first tooth had been extracted, had not entirely united, and a small tubercle had formed from which a fluid of a bad smell and reddish colour was discharging itself. He introduced a probe into the fistulous hole of the tubercle, which after having overcome some obstacle that at first impeded its passage, penetrated the antrum. The opening was enlarged and mercurial water applied to the carious bone, but it soon closed and the pain which had ceased, returned. Injections

were resorted to. These discharged themselves in part through the nasal opening, and the patient continued in this way until an exfoliation of the bone took place, when a cure was effected.

The cause of the disease in this, as in the preceding cases, was alveolo-dental irritation, and a cure, would at once have been accomplished by the removal of the roots of the tooth that had been left in their sockets, as was proven by the fact, that it was not until they were thrown off with their exfoliated alveoli, that it was effected.

In alluding to these and similar cases, Bordenave concludes there are not many cases where the extraction of teeth simply, will suffice to effect a cure. The inference, to say the least of it, is unfair, for in the case last given, it was to the presence of the roots of a tooth, that had been fractured in an attempt to extract it, and left in their sockets, that the affection was attributable, and we have good reason to believe, that the cure was wholly owing to their removal.

The history of the following exceedingly interesting case, which was communicated to the Faculty of Medicine, by Professor Dubois, is contained in the 8th number of their bulletin, for the year '13, and also in Boyer's works on Surgical Diseases.

CASE 10th. Upon a child between seven and eight years old, at the base of the ascending apophysis of the superior maxillary bone, a small hard round tumor of the size of a walnut, was perceived by its parents. About a year after, the child fell upon its face and caused a considerable discharge of matter from its nose, at the same time bruising the tumor. No other injury was produced, and the tumor did not increase perceptibly in size, from the eighth to the fifteenth year. During the next year, however, it sensibly augmented, and from the sixteenth to the eighteenth year, it attained so great a volume that the floor of the orbit was elevated, which caused a diminution in the size of the eye, and restricted the motions of the eyelids. The arch of the palate was depressed and the nasal fossa almost closed. The nose was forced to the right side at the upper part of the tumor,

and there was a considerable elevation beneath the sub-orbital fossa. The skin below the inferior eyelid was of a violet red colour and very tense. The upper lip was elevated and the gums on the left side protruded beyond those on the other side of the arch. Respiration was painful, and the patient spoke with difficulty. Sleep was laborious, and mastication was attended with pain. "In this state," says M. Boyer, "he was seen by M. Dubois, September 1st, 1802, but as he was not able to determine on the proper operation, M. Sabatier, M. Peletan and himself were called in. It was the opinion of all, that there was a fungous tumor of the antrum, and for the removal of this M. Dubois was requested to make choice of his own method of operating.

A fluctuation was felt behind the upper lip, and this determined M. Dubois to commence the operation by making an incision there. This was followed by a discharge of a large quantity of a glairy lymphatic substance. Through this opening a sound was introduced into the antrum, and to M. Dubois' surprise, this cavity contained no tumor, but upon moving the sound about it struck upon a hard substance, in the most elevated part of the sinus, which, on being removed proved to be a canine tooth. Preparatory, however, to its extraction, two incisors and one molaris were removed and their alveoli cut away. Injections were afterwards employed and the patient was soon restored to health.

It is not necessary to stop to inquire how this tooth got into the antrum; aberrations of this sort in the growth of the teeth are frequently met with, and some precisely similar instances have already been referred to.*

In all the cases which have as yet been noticed, the affection was traceable to local irritation, and in all except this last, it had originated in the alveolar ridge. The following case of mucopurulent engorgement may be thought by some to have been occasioned by a different cause. Yet, there are circumstances connected with the history of even this case, that go far to justify

* Vide, note on page 437.

the belief, if the teeth had been in a healthy condition the affection would not have been produced.

CASE 11th. Mr. G——, a labourer, æt. about thirty, of a decidedly scorbutic habit, applied in the spring of 1834, to an eminent medical gentleman of Baltimore, to obtain his advice concerning an affection of the left side of his face, under which he had been labouring for several months. The physician to whom he applied, after having examined the case, came to the conclusion, that it was mucous engorgement of the maxillary sinus, and requested him to call upon me, and have one of his molar teeth extracted, and the floor of the antrum through its alveolus pierced. He at the same time desired, that if his opinion in regard to the nature of the disease proved to be correct, I should take charge of the case altogether. On examining his mouth, I discovered that nearly all his teeth of both jaws, gums and alveoli were extensively diseased, and on inquiry obtained from him the following statement with regard to the commencement and progress of the affection of the antrum.

About six months previous to this time, having been exposed while pursuing his ordinary avocations, to very inclement and several sudden changes of weather, he contracted a severe cold; in consequence of which, he was confined to his bed for several days; during this time, he was twice bled, took two cathartics, and other medicines.

The disease at first concentrated itself in his head, face, and jaws, which at the expiration of eight or ten days, was subdued by the above treatment, with the exception of the pain in his left cheek, and soreness in the superior teeth of the same side. The pain in his cheek, although not constant, still continued; the nasal cavity of that side ceased to be supplied with its usual secretion, the teeth became more sensitive to the touch, and finally at the end of four months, a slight protuberance of the cheek was observable, accompanied by a tumor upon the left side of the palatine arch, which, when I first saw him, had attained to half the size of a black walnut, and it was by the fluctuation here felt, that the physician whom he first consulted, was induced to suspect the true nature of the disease.

Acting under the direction of the medical gentleman in whose care the patient had placed himself, I extracted the second left superior molaris, and through its alveolus penetrated the antrum by means of a straight trocar, after the withdrawal of which, a large quantity of a glairy fetid mucous fluid was discharged. The perforation was kept open by means of a bougie, secured with a silk ligature to an adjoining tooth, as recommended by Deschamps, and the antrum injected three times a day. At first, simply with rose water, to which a small quantity of sulphate of zinc was afterwards added. By this treatment, the lining membrane of the antrum at the expiration of five weeks was restored to health, and the secretions that escaped through the perforation no longer exhaled a fetid odor.

The patient not experiencing any inconvenience withdrew the bougie, and allowed the aperture to close. In about two months, he again presented himself to me, similarly affected as when I first saw him. I now extracted the first superior left molaris, and perforated the antrum through its alveolus, and a quantity of fetid mucous fluid was again discharged; the dens sapientiæ, and the first and second bicuspsides of the affected side, which were carious, were also extracted. Injections of sulphate of zinc and rose water, diluted tincture of myrrh, diluted port wine, a decoction of Gallæ, were alternately employed for three months, at the expiration of which time, the nasal opening which had been previously closed, was re-established, and a perfect cure was effected.

The condition of the teeth in the case just narrated, may not be thought to have exerted any agency in the production of the affection of the antrum, but there are circumstances connected with its progress that would seem to justify a different conclusion.

The presence of decayed teeth beneath the sinus, may not only have contributed to aggravate the morbid action lighted up in it by the cold which he had taken, but may also have caused it to locate itself in this cavity; and the fact that the inflammation of its lining membrane and the obliteration of the nasal opening continued until they were removed, would at least, seem to warrant such an inference. That the injections were beneficial, I do not doubt, but that the cure was effected by them, no one, I think, will dare to affirm. I am far from believing the presence of the

decayed teeth was the sole cause of the disease in the antrum; that they contributed to, and protracted it, I cannot hesitate to believe, and but for the increased excitability and perhaps actual inflammation, induced in the mucus membrane of this cavity, by the exposure of the patient to inclement and sudden transitions of weather, it is probable the sinus would never have become affected. I think it not unlikely, that notwithstanding the disturbance that may have been originated in it by this cause, no very serious or lasting morbid effect would have been produced, if the teeth and alveoli had been in a perfectly healthy condition.

A very interesting case of muco-purulent secretion of the mucus membrane of this cavity, occasioned by an exostosis of a superior molaris, which came under the observation of the author in 1839, is given in a preceding part of this work.

The particulars of the following highly interesting case were communicated to me by DR. L. ROPER, an eminent dentist of Philadelphia, in a conversation which I had with him about three years since.

CASE 12th. Miss M——, a young lady from the West Indies, of about fourteen years of age, had a fistulous opening beneath the right orbit, that communicated with the maxillary sinus. By means of a probe introduced through the opening into this cavity, the apices of the roots of the first superior molaris could be distinctly felt.

Medical aid was sought at an early stage of the disease, but as no permanent benefit resulted from the treatment adopted, the young lady, at the expiration of nine months, was brought by her father to Philadelphia, and in the spring of 1831, placed under the care of the late Dr. Physick; who, suspecting the affection of the antrum had resulted from, and was still kept up by irritation produced by the first superior molaris of the affected side, which was considerably decayed, directed her to be taken to Dr. Roper, who, concurring with him in opinion, at once extracted the carious tooth. The operation was followed by the immediate discharge of a large quantity of thick, muddy, and greenish matter.

The fistula under the orbit soon closed, and without further treatment a perfect cure was accomplished in the course of a few weeks.

The foregoing are all the particulars which I could obtain concerning this interesting case. I have no doubt if all the circumstances connected with its early history were known, it would be found to have resulted from inflammation of the lining membrane of the antrum, caused by irritation in the socket of the tooth that was extracted. This opinion is sustained by the facts, that this tooth was affected with caries, and that its removal was followed by an immediate cure of the disease.

In Bordenave's collection of cases of disease of the maxillary sinus, published in the *Memoirs of the Royal Academy of Surgery*, there are several cases similar to the one just narrated. I subjoin a description of the two following.

CASE 13th. A servant of the Count of Maurepes had been afflicted for six months with a fistula upon the left cheek, a little below the orbit, which penetrated the maxillary sinus, caused by the spontaneous opening of an abscess. The third and fourth molares, (which are the first and second according as the teeth are now designated,) both of which were considerably decayed, were extracted by M. Hevin. As there were no openings through the alveoli, he perforated one with a troear; this opening gave vent to a great quantity of putrid sanies; and did not close for more than a year after it was made. The fistula of the cheek healed in about ten days.

CASE 14th. In 1717, a soldier of the regiment of Bassigny, who had for a long time a fistula in his cheek penetrating into the maxillary sinus, was treated for it at the Hotel Dieu, of Montpellier. The matter settling near the orifice of the fistula, prevented it from closing. M. Lamourier, on examining the mouth of the soldier, perceived that the second superior molaris was decayed; this he extracted and profited by the alveolar cavity, in opening the base of the sinus. The fistula of the cheek was by this

means cured in a few days, but the counter opening was not immediately permitted to close.

In cases of fistula resulting simply from engorgement of the sinus, the treatment, as has been shown by the result of that in the foregoing cases, consists in the formation of a counter opening, which should always be effected at the most dependant part of the cavity, and in the removal of all sources of local irritation. Injections should also be employed.

In the cases thus far presented, I have selected such as were not complicated with abscesses, ulceration of the lining membrane, or caries of the surrounding osseous walls; but to the existence of the two last, the affections on which I have been treating, often give rise. I will not extend my remarks further upon mucous engorgement and a purulent condition of the secretions of this cavity. The next form of disease on which I propose to speak, is abscess—an affection, differing in all its characteristics from those thus far treated upon.

CHAPTER FOURTH.

ABSCESS.

ABSCESS in the maxillary sinus, although very rare, does sometimes happen. The structure of the parts composing this cavity, would seem, as has been remarked by Mr. Bell, to render the occurrence improbable, and if the fact were not well established, it might perhaps be doubted. If the apices of the roots of some of the superior molares did not occasionally perforate the floor of this cavity, the occurrence of abscess in it would indeed be rare, but, as the antrum is sometimes thus penetrated, its formation here is not, after all, a matter of so much surprise. An abscess is as liable to form at the apex of the root of a tooth penetrating this cavity, as at that of one in its alveolus, but it is very seldom that one is found seated in any other place in it. The case described by Mr. Bell is supposed to be the only well authenticated one on record. Bordenave gives the history of a case of disease of the maxillary sinus,* which at the time of my previous allusion to the abscess of this cavity described by Mr. B., had escaped my recollection, so similar, that there can be little doubt in regard to the nature of the disease. In both instances, the affection was seated in the upper part of the antrum beneath the orbit. It is unnecessary to say more at present concerning these cases, as I intend in the proper place, to give a description of them.

Dr. Hullihen, in a well written article in the "American Journal of Dental Science,"† contends that abscess of the antrum as well as alveolar, consists in the effusion of pus, formed in the

* Vide, Mem. de l'Acad. Royale de Chirurg. vol. 12, ed. 12mo. obs. xi. p. 31.

† Vide, vol. ii. page 179.

pulp cavity of a tooth, "between the bone and lining membrane." That this view of the subject is incorrect, is proven by the fact that abscesses are as frequently formed in the sockets of dead teeth as living ones. The matter from alveolar abscess in those cases where the plate of bone intervening between the extremity of the root or roots of a superior molaris or bicuspid, as the case may be, being thinner than the osseous walls surrounding it or them, often escapes through it into this cavity, after having first, as Mr. H. justly remarks, effused itself between the bone and lining membrane. In this case, it cannot properly be termed an abscess of the antrum. Although the matter escapes into this cavity, and it, in consequence, becomes involved in disease, yet the disease having originated in the alveolus of a tooth, which is still its principal seat, is, in the strictest sense of the term, an alveolar abscess. It not unfrequently happens that pus from an abscess formed in the socket of a superior molaris, discharges itself into this cavity and escapes through the nasal opening for months and sometimes for years; for, after an abscess has once formed at the apex of the root of a tooth, purulent matter will continue to be formed, though not always in the same quantity, until the irritant that caused it is removed. The pulp, or ganglion as some French writers term it, may suppurate, and the matter be confined in the cavity of the tooth for a long time without causing alveolar abscess, and the purulent matter contained in the sac at the extremity of the root of a tooth, is not formed, as Mr. H. supposes, in the cavity of the organ. The alveolo-dental membranes at the apex of the root of a tooth around the nerve cord, are more vascular and are endowed with greater nervous sensibility, than at any other part, consequently the inflammatory action here is always the greatest, and it is here suppuration first takes place.

The apices of the roots of the first and second superior molares, when they do not actually perforate the floor of the antrum, are often above its level, and covered by only a very thin shell or cap of bone, and hence in case of an abscess in one of these, although strictly alveolar, the matter is more liable to make for itself a passage into this cavity, than through the gum into the mouth. When this happens, it gives rise to inflammation of the lining membrane and causes its secretions to become more or less

vitiated, and often leads to an erroneous opinion concerning the real nature of the disease.

It is only when the root of a tooth actually penetrates the floor of the antrum, or the tubercle at its apex becomes situated in it, that the abscess can properly be said to be of this cavity. When the root of the tooth does penetrate it, the tubercle, although formed at its apex around the nerve cord, as it is commonly called, is between the lining membrane and periosteal tissue, both of which, in the immediate vicinity become directly involved in the inflammation, and this sometimes extends itself to every part of the cavity, causing in some instances, an obliteration of the nasal opening. This, however, does not often occur, but when it does, is followed by engorgement of the sinus, and occasionally, by ulceration of its lining membrane, and disease in the surrounding bone.

It is sometimes the case, the plate of bone intervening between the extremity of the root of a tooth, around which a tubercle has formed, and the antrum is destroyed, and the tubercle, instead of being wholly confined within the alveolus, is forced up, as it enlarges, almost entirely into this cavity. The inflammation after having attained a certain height, is succeeded by suppuration, and the secretion of pus goes on until the sac bursts, when the matter is discharged, and, mixing with the mucous secretions of this cavity, ultimately escapes with them through the nasal opening, if it be not closed, into the nose.

As it regards the morbid effects produced upon the lining membrane and surrounding bony parietes of the antrum, by an abscess of this kind, it is of little consequence whether it be formed in it, if the matter be discharged there, or in the alveolus of the tooth that gave rise to it. The effects are about the same in one case as in the other. If the general health of the patient be good, and the natural opening of the sinus remain pervious, they seldom assume an alarming character; under other and less favourable circumstances, the most dangerous and aggravated forms of disease to which this cavity is liable, may result from an abscess seated in either place.

SYMPTOMS.

In the incipient or forming stages of abscess of the maxillary sinus, the symptoms are similar to those that characterize inflammation of the lining membrane of this cavity, or violent inflammatory tooth-ache. The pain is generally most severe in the upper part of the alveolar ridge, above some one of the molar or bicuspid teeth. From thence, it often extends to the lower part of the orbit, ear, temple, muscles of the cheek and scalp. It is more or less constant, and a throbbing is felt high up in the alveolar border beneath the cheek. If the abscess originate at the apex of the root of a tooth, this organ will appear slightly elongated and sore to the touch; the cheek in most instances is a little tumefied and more or less flushed.

The pain, after having continued for several days, is succeeded by suppuration, when it immediately subsides. Slight paroxysms of cold and heat are now felt, and if the natural opening of the antrum be not closed, purulent matter will occasionally be discharged.

If the abscess be seated in any other part than the base of the antrum, the symptoms may differ in some respects from the foregoing. If purulent matter, or mucus mixed with pus be discharged from the nostril of the affected side, when the patient inclines his head to the opposite one, or makes a sudden and forcible expiration through it, while the other is closed, the existence of abscess in this cavity, will be very conclusively indicated.

The abscess having burst, pus will be discharged from it, from time to time, for several days, which will escape through the nasal opening, except this passage has become closed with hardened flocculi or other foreign matter, and then it will cease altogether or very nearly so. The disease, however, if the irritant giving rise to it still remains, is by no means cured. A recurrence of it generally occurs every time the patient takes cold, when all the symptoms just described will be again experienced, and each succeeding attack leaves the parts implicated in the morbid diathesis thus lighted up, in a more unhealthy condition,

and as a consequence more susceptible of being acted upon by morbid irritants. Suppuration also, at each successive attack, takes place, and the pus gradually assumes a worse character.

CAUSES.

It will not be necessary to say much concerning the causes of abscess of the antrum. It will be sufficient to state, they are the same as those of tooth-ache, inflammation of the alveolo-dental periosteum and inflammation of the lining membrane of this cavity, and it is to the presence of one or other, or both of these it is attributable. These may be excited, by caries of the teeth, a blow upon them, or a dead or loose tooth, or a blow upon the cheek and by exposure to sudden changes of weather. Other causes may sometimes be concerned, but the foregoing are the principal, and all that is necessary to be enumerated here.

TREATMENT.

In the cure of abscess of the maxillary sinus, as well as that of a muco-purulent condition of its secretions or engorgement, the first and most important indication to be fulfilled, is to obtain a vent for the matter, from the inferior part of the cavity. The best method of doing this has before been described, and it is unnecessary to recapitulate the directions already given for the accomplishment of this object.

The formation of abscess might however, in almost every instance, be prevented by the timely adoption of proper treatment. On the occurrence of severe, deep-seated and throbbing pain in the upper part, of the alveolar ridge or just above it in the region of the antrum, such as has been described as attending the formation of abscess in this cavity or that of the alveolus of a superior molaris; or if the tooth directly beneath the place where it was first felt, be considerably decayed, or its lining membrane exposed; or if it be dead, loose, or the socket much diseased, it should be immediately extracted. By this simple operation, the formation of abscess not only in the socket but also in the antrum, may, in almost every instance, be prevented. If it be not followed by an

immediate subsidence of pain, leeches should be applied to the gums and fomentations to the cheek. If the patient be of full habit, and there be any general febrile symptoms, saline purgatives may also be employed with advantage. In the majority of cases, the extraction of the tooth will be all that is required to arrest the progress of the disease.

The curative indications, if the abscess be of recent formation, and has resulted from the presence of a diseased tooth, are similar to the preventive. The first thing to be done is to remove the tooth that caused it, and if this operation be not delayed too long, it, in most instances, will be all that is necessary to effect a cure. In addition to this, Mr. Hullahen recommends the perforation of the antrum;* but in those cases where the abscess has formed at the apex of the root of a molaris, this is not necessary; because in all such cases, the alveolus communicates with this cavity, so that on the removal of the tooth, there will be a sufficiently large opening into it; besides, the tubercle or sac although situated within the sinus, is in nearly every instance, brought away with the tooth.

When the abscess has been of long standing, and the lining membrane of the antrum become seriously affected, in addition to the removal of the tooth, other treatment will have to be resorted to. The opening into the antrum, if necessary, should be enlarged, and it should be prevented from closing until the health of the lining membrane is restored; and for the promotion of this, injections, such as have been previously recommended,† will be found serviceable.

In cases of simple abscess of the antrum, seated at the apex of the root of a superior molaris, I have never found it necessary to adopt other treatment than the foregoing. It may, however, in some instances, be necessary to remove more than one tooth, though that be the one that gave rise to the abscess. The following case presents an example of this kind.

CASE 15th. Miss E. M——, æt. seventeen, of a scrofulous habit, was placed under my care in the spring of 1837, for the

* American Journal of Dental Science, vol. ii. p. 182. † Vide page 57.

purpose of obtaining relief from a severe, deep-seated pain in her right cheek, apparently a little above the first superior molaris, and which was supposed to result from a diseased condition of several teeth on that side of the upper maxillary. The pain, although very severe, seldom lasted more than three or four days. She had experienced several attacks of it,—the first about eighteen months before I saw her, and its subsidence, every time, was followed by occasional discharges of purulent matter from the nostril of the affected side. These discharges, at first, continued only for three or four days, but they lasted longer after each successive attack, and became more acrid and offensive.

Three days previously to my seeing her, she had an attack, and the inflammation at the time nearly reached a crisis. Her cheek was slightly swollen and considerably flushed, and an exceedingly painful throbbing sensation was felt in the region of the malar apophysis. I directed four leeches to be applied to the gum covering the lower part of this, beneath the cheek, fomentations to the face, and pediluvium before going to bed. These, I was informed, had been prescribed in preceding attacks, and only very temporary benefit had been obtained from them. I, in consequence, contented myself, knowing the inflammation would soon run its course, by advising the application of anodyne fomentations to the face.

The next day I saw her, and the pain had nearly subsided, but there was considerable inflammation and sponginess in the gums around the superior bicuspid and molar teeth. The first molaris was very sensitive to the touch. The morning of the second day after I saw her, matter resembling pus, and of a fetid odor, was discharged from the nose. Believing this came from an abscess in the antrum, caused by the presence of the first superior molaris, I advised its immediate removal, to which, after considerable persuasion, she submitted. As I had suspected, this proved to be the tooth which had occasioned the mischief. At the extremity of its two outer fangs, which were almost in contact, was a tubercle the size of a large pea, and there was an opening into the antrum through which a small goose-quill could be passed. A considerable quantity of bloody mucous matter streaked with pus, immediately escaped from it. The importance of having

several other decayed teeth removed, was urged, though not as necessary to the cure of the affection to which she had been subject, but she would not submit to the operation.

Three weeks after the extraction of the tooth, I again saw her, and was informed that she had not since experienced any pain; the alveolus had closed, but a glairy fetid matter was occasionally discharged from her right nostril. The alveolus was re-opened by cutting away the fleshy granulations that had filled it, and a small quantity of matter such as I have just described, came away. Injections were now employed of diluted tincture of myrrh and rose water with a small quantity of sulphate of zinc. The opening was prevented from closing, and the use of the injections persisted in for three or four weeks, when the bougie that had been inserted in the alveolus to prevent it from filling up, was left out. The opening soon closed, and in the course of ten or twelve days, a glairy fetid matter was again occasionally discharged from the nostril of the affected side, and again a vent was procured for it through the socket of the tooth that had been extracted. This was now kept open for five or six weeks, when it for a third time was permitted to close, and for two weeks there were no signs of a return of the discharge of fetid glairy mucus from the nostril; at the expiration of fifteen or sixteen days it became apparent that the mucus membrane of the antrum was not restored; its secretions again became fetid. Suspecting that the diseased condition of the teeth, gums, and alveolar processes beneath the cavity exerted a morbid influence upon it, I, a second time, urged the removal of the first bicuspid, and the second and third molars, which were all so much decayed as to render their restoration out of the question. With much persuasion the consent of the patient was obtained, and the teeth were at once extracted.

Four weeks after, the secretions of the antrum had become healthy, and they have since remained so.

The morbid condition of the mucus membrane of the antrum, although in this case it no doubt resulted from the abscess formed at the apices of two of the roots of the tooth first extracted, was subsequently kept up, by the irritation of the alveolo-dental membranes, occasioned by the other decayed teeth.

Before I conclude my remarks upon abscess of this cavity, I will give the history of the two cases to which allusion has before been made, the one is narrated by Mr. Thomas Bell, and the other by Bordenave. The following detailed statement of the first I quote from the author's treatise on the teeth.

CASE 16th. "Mary B——, aged eighteen, of an unhealthy and somewhat strumous aspect, of languid disposition, and of retiring and timid habits, came under my care on the 3d of January, 1817, in consequence of severe and continued pain on the left side of the face, of a dull heavy character, and, apparently deep-seated; but occasionally darting in acute paroxysms, across the face towards the nose. The cheek was swollen, and the palate somewhat enlarged. About a year before the first superior molaris of that side had been extracted on account of severe pain in the face, but without producing any relief, and the pain was consequently attributed to rheumatism, from which complaint she had long suffered to a great degree, in the shoulder, hip, and other joints, and for which she had been under the care of many medical practitioners, both in London and Bath, having been sent to the latter place for the use of the waters. When I first saw her, the general health was much deranged: the stomach, bowels, and liver performed their functions very imperfectly; and the uterus partook of the general sluggishness of the system, menstruation being almost wholly suppressed, and the periods only indicated by increased indisposition, and especially by an exacerbation of the pain in the face.

No discharge had taken place from the nose, but, from the nature and situation of the pain, the direction of its paroxysms, the enlargement of the cheek and palate, and from an occasional trifling discharge of pus from the alveolus of the tooth which had been extracted, I could not doubt that the antrum was the seat of the disease. On examining the teeth, I found that the second bicuspid also was diseased, and as it had at times occasioned considerable pain, I extracted it with the view of removing every possible source of irritation.

Six leeches were ordered to be applied to the face, and afterward the continued application of a cold lotion. Medicines were

also administered with reference to the general health, both as regarded the digestive and uterine functions; and on January 7, I determined on puncturing the antrum. I consequently introduced the trocar through the anterior alveolar cavity of the first molaris, and found that when the instrument came in contact with the lining membrane, the most acute pain was produced, indicating the existence of a high degree of inflammation in that structure. On withdrawing the trocar, when the antrum was freely opened, I was surprised, and a little disappointed, at finding that not the smallest discharge made its appearance. There was a small quantity of glairy mucus, but nothing more. I introduced the blunt end of a probe, and found that the opening was quite free; but on passing it upwards towards the orbit, its passage was resisted by a firm elastic substance, which gave the impression that a solid tumor existed in the upper part of this cavity, and which produced intolerable pain, on being pressed with the probe. I now injected some tepid water, and found that the nasal opening was pervious, as the water passed freely into the nose. As the operation had produced a considerable increase of pain, and as the parts appeared a good deal inflamed, I ordered six leeches to be applied, the bowels to be freely opened, and an opiate to be taken at night.

January 9. The pain has been extremely severe ever since the operation, with scarcely any mitigation excepting for a few hours after the application of the leeches. A probe now introduced into the antrum, met with similar resistance, but much nearer the orifice than before, proving that the tumor had increased; and on injecting warm water, it no longer passed into the nose. The leeches, the aperient, and the opiate were repeated.

January 11. The pain has continued without cessation, and no sleep has been procured by the opium. The inflammation is not apparently reduced. Pulse one hundred, small and feeble. The palate is a little enlarged, but not more so than might be accounted for, by the thickening of the integuments by inflammation, I could now distinctly feel with a probe, that the tumor was not only increased in size, but that it had become softer, yielding in some measure to pressure, and conveying the impression that it contained fluid. I therefore introduced a sharp-pointed instru-

ment, which, with a little force, pierced the tumor, and a gush of pus instantly took place, with immediate relief to the symptoms.

Here, then, was a *sac* containing pus, existing doubtless as a distinct cyst, the result of inflammation in the membrane; for it is scarcely probable that the membrane itself had become separated from its attachment by the formation of pus between it and the bone. That the former was the true situation of the disease, may be inferred from the fact that no subsequent caries of the bone took place, which would, undoubtedly, have been the case, had the matter been formed in contact with the bone; and it could scarcely have been produced between the mucus membrane and the periosteum, as these two structures, though essentially distinct from each other, are inseparably connected.

The pus continued to be discharged for a day or two, and then entirely ceased. On passing the probe a week after the former operation, I found the same resistance as before, and in the same situation; the cyst was again punctured, and again the pus was discharged. This alternation of the repletion and evacuation of the cyst regularly recurred for a considerable time, but the opening into the nose did not again become stopped. The general health, however, in the meanwhile, improved, and the pain in the face was greatly diminished, returning only, with any degree of violence, when the cyst was full.

At length the repeated perforation of the *sac*, followed by the use of strong astringent injections, and aided by the remedies that were directed to the state of the general health, restored the antrum to a healthy condition; the menstrual disturbance was by degrees entirely obviated, and the stomach at the same time assumed its healthy function; but it was two years from the time when I first saw her before she had recovered her health, which at the best was never robust."

The case described by Bordenave, is, in many respects, similar to the foregoing, but having adopted a different treatment, the cure was more tardy. It was ultimately, however, effected. For the particulars of the case, the reader is referred to a Dissertation of the author on the diseases of this cavity, page 86.

Finally, that abscess does occasionally form in other parts of this cavity than the base, is conclusively proven by the two last cases. It is true, these are the only ones of which we have any account, nevertheless, they establish the fact that it is possible for them to occur in any part of the sinus.

CHAPTER FIFTH.

ULCERATION OF THE LINING MEMBRANE.

THIS is not an idiopathic affection. It is always, I believe, symptomatic of some other morbid condition of the mucus membrane of this cavity, and often gives rise to some of the worst and most aggravated forms of disease that are ever met with. It is not a simple disease, but is complicated with the one that caused it, and often with some other to which it has given rise. I shall treat of it, however, as a separate affection. Its attacks are preceded by purulent condition of the fluids of the antrum, and are often followed by fungi and sometimes by caries of the surrounding osseous walls. The membrane covering the floor of the cavity, is usually first attacked; ulcers having formed, they generally soon extend themselves to other parts of the sinus.

Ulceration of this membrane is frequently complicated with ulceration of the lining membrane of one or both of the nasal cavities. It is sometimes mistaken for ulceration in the nose, but it is not easy thus to mistake the seat of the disease. The existence of ulcers in the antrum can only be inferred from certain signs; but when seated in the nose, they can almost always be seen. The matter secreted by those situated here, exhales a less fetid odor than that of ulcers of the maxillary sinus. The reason is obvious. The air that finds its way into this cavity is retained in it a long time and consequently becomes more highly impregnated with the fetor of the matter secreted in ulcers situated here, than it does with that of ulcers in the nose, over which, it is almost constantly passing. This of itself, as has been justly remarked by Deschamps,* will enable us to determine, almost to a certainty, the seat of the disease. There are other signs that will assist us in

* *Maladies des Fosses Nazales*, sec. 2, Art. vi. p. 262.

ascertaining its location. The foregoing, however, are sufficient, especially when taken in connection with symptoms that precede the formation of the ulcers.

Ulcers of the maxillary sinus present as great a variety of character as do those of other parts of the body. Their nature is determined by the state of the constitutional health and the causes that produce them. It is not necessary to go into a minute description of the various kinds of ulcers that are here met with. It will suffice to state that, for the most part, they partake of the disposition of the subject in which they occur. The following varieties have been met with; namely, the simple, or those resulting from mechanical injury; the fungus; scorbutic; venereal; cancerous; gangrenous; scrofulous; inveterate; carious, &c., &c. Sir Everard Home divides ulcers into six kinds, each of which is to be determined by the nature or condition of the part in which it is situated.* The first, are ulcers in parts endowed with sufficient strength or curative power to effect their restoration. The second, are those situated in parts too weak to effect a recovery. The third, are ulcers in parts having too great an action for the formation of healthy granulations. The fourth, are those seated in parts possessed of too indolent an action, whether arising from the state of the parts or general constitutional health. The fifth, are ulcers located in parts that have acquired some specific diseased action. The sixth and last, are those situated in parts that are prevented from giving out healthy granulations, by a "varicose state of the superficial veins of the upper part of the limb." These remarks are applicable only to ulcers in general; yet, as those of the maxillary sinus often present characteristics similar to those of other parts of the body, they may not be deemed inappropriate here. The kind of ulcer last noticed, however, never occurs in the antrum.

In the simpler species of ulcer, the matter is of a thick consistence and nearly white, but as the disease increases in malignancy, it becomes thinner and varies in appearance from transparent to a dirty brown, yellow or black.

* Cooper's Surgical Dictionary, vol. ii. p. 381.

SYMPTOMS.

Many of the signs attendant upon ulceration of the mucus membrane of the maxillary sinus, are similar to some that accompany other affections of this cavity; as for example, deep-seated heavy pain in the cheek; occasional escape of matter into the nose, &c. &c. In addition to constant pain in the region of the antrum, the following may be mentioned as signs indicative of ulcers of this cavity. The escape of a fetid sanies into the nose on the patient's inclining his head to the opposite side, or through an opening which it has itself effected, or that has been formed by art for its escape. Also, the traversing of the ulcer from the interior through the bony walls of the cavity and external soft parts. An opening of this sort may be effected through the cheek, near, or even into the orbit, which last has often happened; at other times it is effected through the canine fossa or palatine arch. Moreover, the matter escaping from the sinus, often has flocculi mixed with it, which is never the case, in simple muco-purulent secretion of the sinus. These flocculi sometimes choke up the natural opening of the cavity and cause its secretions, together with those of the ulcers to accumulate, and distend its osseous walls until they ultimately give way, or an opening is formed for their escape. It occasionally happens that the flocculi that have gotten into the nasal opening, and thus prevented the egress of the fluids secreted here, after choking up this conduit for a long while, suddenly give way and permit the matter to pass into the nose.

When the ulcer is of a fungous character, the matter secreted by it, is thin and of a dark brown or blackish colour; and has mixed with it blood and pus.* It is, says Deschamps, slightly painful, and can only be distinguished from other ulcers by the introduction of the bougie into the sinus; and like polypus, it is capable of spreading and penetrating every opening that will give it passage; but in consequence of its being of a softer consistence, it makes less impression upon the surrounding parts.

If the ulcer be of a cancerous nature, the pain will be sharp

* *Maladies des Fosses Nazales*, sec. 2, Art. vi. p. 263.

and lancinating and affect the whole of the side of the face ; the matter will be serous, very fetid, and streaked with blood. If it is discharged through the natural opening into the nose, it will cause the pituitary membrane of the nasal cavity of the affected side to become exceedingly irritable, sensitive to the touch, and ulcerated. The bones of the affected side of the face soon become softened or carious, the teeth loosen, the external soft parts inflame and ultimately ulcerate ; openings are formed into the sinus, fever of a low grade supervenes, and ultimately death closes the scene.

CAUSES.

A degenerated or altered state of the secretions of this cavity, is said to be the most common cause of ulcers in it.* This may be an exciting cause, and it may be one of the most frequent exciting causes, but were it not favoured by a constitutional predisposition, it would not often give rise to them. Local irritation, whether produced by an altered condition of the fluids of this cavity or by the presence of decayed or dead teeth, the roots of teeth, or a blow upon the cheek, may be, and doubtless is, the exciting cause of ulcers in the mucus membrane of this sinus. This, however, in a subject of good constitutional health, would have to be very severe and continue for a long time, to result in ulceration of this membrane, and even then, a cure would soon be effected by the restorative powers of the economy. It is only in bad habits, or debilitated constitutions, that malignant ulcers are often met with in the maxillary sinus.

Dcschamps, although he acknowledges diseased teeth often exercise a morbid influence upon this cavity, and the apices of the roots of these organs are sometimes in contact with its mucus or lining membrane, seems nevertheless to doubt that they have any agency in the production of ulcers. His reasoning upon the subject, is far from satisfactory. While he admits, by the contact and adhesion of the dental periosteum and mucus membrane of this cavity, by the penetration of its floor by the roots of teeth, inflammation and ulceration may be produced, he denies that it can be positively proven. Although we may not be able to

* *Maladies des Fosses Nazales*, sec. 2, Art. vi. p. 159.

adduce positive evidence in confirmation of it, the circumstantial proofs which we have, are so clear and strong, that no candid inquirer can for a single moment doubt, that the disease in question, when favoured by a bad habit of body, often results from dental or alveolar irritation. In reply to the question which he a little further on propounds, "How can the extraction of a tooth be of service in the subduction of inflammation of the mucus membrane with which the dental periosteum is only simply in contact,"* I answer, by this operation a constant source of irritation may be, and often is, removed. Ulcers having absolutely formed, a cure cannot always be effected by the removal simply of the exciting cause.

Inflammation of the lining membrane of the maxillary sinus, and as a consequence, an altered condition of its secretions, may, it cannot be denied, be produced by other causes than irritation resulting from a diseased condition of the teeth, and it is to this, that ulceration in it, is attributable.

TREATMENT.

As in the case of mucous engorgement of this cavity, the first indication of cure is to give egress to the purulent matter, and in this as in the other affection, the opening should be formed at the most dependant part of the sinus; and this should be effected in the manner as before described through the alveolar border or rather alveolus of a molaris. It should be made large enough to admit the little finger, and if there be any teeth so much affected as to be productive of irritation to the parts subjacent to the antrum, they should be removed.

Free egress for the matter having been obtained, and all local irritants removed, the antrum should be injected from time to time, with gently stimulating and detersive fluids. This, in cases of simple ulcer, if the constitutional health be not seriously impaired, will often, as is proven by the result of the treatment detailed in the history of the following case, be all that is necessary to effect a cure.

* *Maladies des Fosses Nazales*, sec. 2, Art. vi. p. 259.

CASE 17th. Mrs. R——, æt. about twenty-five years, of a scrofulous habit, having been affected for several months with a pain in her left cheek, which at times was very severe, and supposing it might be connected with her teeth, applied to me in the winter of 1836, for the purpose, if possible, of obtaining relief. She informed me that she had been several times temporarily relieved by a sudden discharge of matter from the nostril of the affected side, after sneezing, and once after a violent expiration through this cavity of the nose while the other was closed. I at once suspected the disease to be ulceration of the mucus membrane of the antrum, and a purulent condition of its secretions.

On examining her mouth, I found the most of her teeth to be more or less affected with caries. The crowns of the first and second superior molares of the left side were nearly destroyed, and over the roots of the second, externally, was a fistula from which matter had at times been discharged, as I was informed, for several years. This communicated with an abscess partly between the apices of its three roots; and, as neither this nor the first molaris was of any service, their restoration being wholly impracticable, and as both obviously exercised a morbid influence upon the neighbouring parts, I advised their removal. To this operation she readily submitted, and it having been performed, I perforated the antrum through the socket of the second tooth, by means of a suitable trocar. The withdrawal of the instrument was followed by the discharge of more than a table-spoonful of thickened fetid mucus, streaked with blood and pus. The opening was enlarged to about the size of a goose-quill, and the sinus injected with tepid water and the tincture of myrrh. The opening was prevented from closing by means of a bougie prepared for the purpose. Whenever this was removed during the first eight or ten days, a small quantity of whitish pus was discharged with the mucus secretions of the cavity. The injections were continued for about four weeks, and at the expiration of this time, as the secretions of the antrum had ceased to be offensive, and as they were no longer mixed with pus, the bougie was left out and the opening permitted to close. A complete cure was effected.

If the ulcer be of a fungous nature, the employment of eschar-

oties, and sometimes even the actual cautery becomes necessary; this last should be repeated until the fungi are completely destroyed. With regard however to the employment of escharotics, such as the nitrate of silver, blue vitriol, &c. &c., for the purpose of destroying luxuriant granulations in ulcers, Sir E. Home is of the opinion it is better to combine them with some other substance, so as to prevent them from immediately destroying the granulations. He believes when this is done, the surface of the ulcer underneath, is more liable to reproduce them, than when they are removed by absorption, and it is for this reason he prefers, in the employment of caustics, to mix them with other substances, so that they shall only exercise a strong stimulating effect, and thus cause the granulations to be gradually removed by the action of the absorbents.

The surface of the ulcer should, if practicable, be kept clean by means of dossils of dry lint or pledgets spread with some simple ointment. The treatment of ulcers of this cavity, is usually attended with more difficulty, on account of their concealed situation, than those of most other parts of the body. Among other things, Deschamps recommends injections of a decoction of quinine. In many cases a lotion of sulphate of zinc may be used with advantage. The remedies to be employed in the treatment of ulcers of the maxillary sinus, as in the treatment of ulcers of other parts, should be varied to suit the indications of each particular case. In debilitated subjects, tonics, as quinine and preparations of steel, are said to be highly serviceable. There are some cases in which mercurials are highly beneficial. Strict attention should always be paid to the regimen of the patient, and such general treatment adopted as may be best calculated to restore the constitutional health, for upon this, the cure of the local affection often depends.

If the ulcer be of an irritable nature, warm fomentations, (conveyed to the interior of the antrum by means of a properly constructed funnel,) of a decoction of poppy heads, chamomile flowers, or the leaves of hemlock, will often prove beneficial in soothing the pain. Tincture of myrrh, diluted, or a decoction of walnut leaves may be advantageously employed as injections in

cases of indolent ulcers,—the last of which, is recommended as an application to ulcers of this character in other parts of the body by Hunezawsky, and both of which are favourably spoken of by Sir E. Home. This last named writer recommends “diluted sulphuric acid and the juice of the powder of different species of pepper in a recent state;” also nitrous acid diluted with water. The unguentum hydrargyri nitrate, mixed with lard, the ceratum resinæ, and the unguentum elemi, mixed with the balsam of turpentine, are also recommended. The application of ointments to ulcers of this cavity is always attended with inconvenience, and on this account they are less easily cured when seated here than when situated in other parts of the body.

Many of the ulcers of the maxillary sinus are regarded as incurable, as for example, such as are of a cancerous nature, and ulcerated fungus hæmatodes. Although the resources of surgery have hitherto, in most instances, proved inadequate to the cure of these formidable diseases, nevertheless they should be put in requisition, and we should endeavour to combat them by every means in our power. Deschamps says, the interior of the antrum should be exposed at the commencement of the disease. He recommends the formation of a large opening, if the alveolar ridge be healthy, above it, if not, through it. As much of the cavity as possible should be exposed. This done, he directs, if there be a cancerous tumor, that it be as thoroughly extirpated by means of a curved and flat bistoury or curved scissors as possible. All that may have escaped removal by this means he says, should be touched with the actual cautery. These, he says, are the only remedies “to be employed when the membrane is in a state of cancerous ulceration.” The surgeon, he adds, “should destroy the parts in such a way as to leave only the osseous surfaces, and he should pay some attention to these bony parts, which also, he should carefully cauterize.” The disease having been thus removed, the surrounding osseous walls that have been cauterized will soon exfoliate, when a chance for a cure will be afforded, and of which, if the neighbouring parts have not been so extensively invaded, nature will avail herself. The administration of soothing and anodyne medicines are also directed. Arsenic has

been employed with advantage both as an external and as an internal remedy in ulcers of this kind.

There are other kinds of ulcers of this cavity, but it is not necessary here to describe the treatment for each of the various forms which this description of disease puts on. Particular and ample directions for each are laid down by writers on affections of this kind, and though they may not have special reference to their occurrence in the antrum maxillare, they will, for the most part, be found as applicable to them, as when they are seated in other parts of the body.

The following case of fungus ulcer complicated with alteration of the walls of the sinus is taken from Bordenave's collection of observations on the diseases of this cavity, in the Memoirs of the Royal Academy of Surgery. Although the history of the case, in its translation, is abridged a little, yet no important fact connected with it is omitted.

CASE 18th. The subject of this case was a woman twenty-six years of age; who having exposed herself, while in a critical state of health, to cold air, was in 1759, attacked with acute pains in the left side of her upper jaw, in the alveolar ridge of which, were the roots of several decayed teeth. The following day her jaw was much swollen, and although the pain ceased in a few days, the swelling still continued, without any change in the appearance of the skin; nevertheless, her face was deformed in shape. The orbitary apophysis of the maxillary bone became elevated, and the substance of the bone softened. The interior of the nose was affected and the opening of the sinus into this cavity was closed. The matter collected in the antrum began to escape, twenty-two days after the attack, through the alveoli.

In January, 1761, the symptoms becoming more aggravated, she went to Paris for medical aid. M. Beaupreau was consulted, and on examining the affected parts, determined on the extraction of the decayed teeth, which were considerably broken. They however adhered so firmly to their alveolar cavities that he could not move them without shaking their sockets. This deterred him from proceeding with the operation as he had begun, and he re-

solved to remove the whole of the alveolar border with a bistoury, from the lateral incisor to the first molaris, and in this way remove the teeth with the bone. This done, he made a section of the bone, which had become softened, with a pair of scissors, in the direction of the cuspisatus. The antrum was much dilated; its membrane fungous and ulcerated. He then treated it with detersive injections, adhesive dressings, covered with digestives, composed of the oil of turpentine. In addition to these, mercurial ointment and red precipitate were used. Alterative pills and beverages clarified with cress, were also prescribed; this treatment was successful, for, five days after it had been commenced, the tumor had perceptibly diminished, the pus became of a better quality and less in quantity. At the expiration of two months the discharge became mucous. Injection of lime water, at first strong, and afterwards milder, were used. The natural opening was closed, and continuing impervious, an opening through the base of the sinus was preserved. At the expiration of two months the parts had recovered, and the general health of the patient was restored.

The medical treatment in the foregoing case was very proper; it accorded with the curative indications of the disease, but the surgical, evidently involved a greater sacrifice of parts than was absolutely called for. The extraction of teeth was not, however, as well understood at that time as at present, and it was to the want of proper knowledge and skill in this department of surgery, that the removal of so considerable a portion of the alveolar ridge was had recourse to. It is often necessary to make a very large opening into the sinus, but it is seldom requisite to make one as large as the one made in this instance; although nearly the same treatment was adopted in a case of somewhat similar nature by Bourdet, the practice is nevertheless objectionable. When the subjacent bone and alveolar border are in a carious or necrosed state, their removal would be proper, and there are diseases that occur in this cavity which render the operation necessary, but in neither of the cases just noticed were the bones carious, nor was the nature of the disease such as to require so large an opening. In the first case, the outer wall of the sinus, as would seem from the description given, was softened, but in the other, Bourdet says the bones were not diseased.

It sometimes happens when the inferior opening is very large, it never closes, and when the natural opening becomes obliterated, it is requisite to preserve one through the alveolar ridge; in either of these cases the employment of an obturator is necessary to prevent particles of food and extraneous matter from getting into the sinus. Of these, I shall hereafter speak.

The history of many highly interesting cases of ulceration of the mucus membrane of this cavity, might be introduced, but as this form of diseased action is so often complicated with caries, necrosis and other alterations of its osseous walls, I have thought it would be as well to reserve them until I treat of those affections; which I shall now do.

CHAPTER SIXTH.

CARIES, NECROSIS AND WORTENING OF THE BOST PERIETAL.

VARIOUS opinions concerning the pathological peculiarities of the several morbid conditions of the osseous tissues of the body have been advanced. It is not my intention, at this time, to select any of them, further than may be necessary to a correct explanation of the curative indications of the diseases of those of the maxillary bone.

Bones are endowed with vitality, and like other parts of our organization, liable to disease. They are furnished with blood-vessels, nerves and absorbents, from which they derive nourishment, and, the teeth excepted, the power of undergoing various changes. These attributes are more peculiar to some bones than others. The power of recuperation, for example, is possessed in a much higher degree by cylindrical than flat bones: the teeth are entirely destitute of this attribute. Unlike other bones, they are incapable of repairing any loss of substance which they may sustain from mechanical violence or other causes. Not in their morbid conditions, exostosis and necrosis excepted, bear any resemblance to those of other bones.

Excepting the affections of these organs, the diseases of the bones are regarded by most writers, as analogous to those of the soft parts, and alike susceptible of being affected by constitutional vices.

By the ancients, caries and necrosis were regarded as one and the same disease. Modern surgeons, however, discriminate one from the other. Caries of bones, is represented as analogous to ulceration of soft parts, while necrosis is said to be similar to mortification. Caries does not at once destroy the vitality of the bone: a diseased action, tending to soften and otherwise alter the

texture of it, is often, for a long time carried on. Its cells are filled with fungous flesh, and there is constantly discharged from the affected part, a dark-coloured fetid sanies. Necrosed bone, is deprived of all vitality. The whole or only a part of a bone, (except when it occurs in a tooth, and then the whole organ perishes,) may be affected.

Besides caries and necrosis, there are other morbid conditions to which bones are liable. I shall at this time, speak of but one, and that consists in a softening of their texture, which, by surgeons, is designated "*mollities ossium*." This softening is supposed by some, to be owing to the absorption of the phosphate of lime of these tissues. I am inclined to the opinion that it is occasioned by the chemical decomposition of this earthy material, by some morbid or altered fluid exhaled or poured out upon part of the bone thus affected.

Having premised these few general remarks, I shall proceed to notice more particularly the affections to which I have just adverted as occurring in the walls of the maxillary sinus. The bony parietes of this cavity, and sometimes the whole of the subjacent alveolar border, and that of the superior maxillary; the nasal, palatine and orbital bones, as well as some that belong to the base of the cranium and the malar bone, are involved in caries or necrosis. *Mollities ossium*, though rarely occurring in the alveolar ridge, frequently affects the walls of the sinus. Caries may affect a considerable portion of both for a long time, without completely destroying the vitality of the diseased parts. During its continuance a fetid sanies will be discharged from one or more fistulous opening through some part of the cheek, alveoli, gums, palatine arch, or into the sinus, and from thence through the natural opening into the nose. The disease eventually terminates in the decomposition and death of the parts affected, and then by an operation of the economy, this is separated from the living bone and thrown off, or in other words, is exfoliated. Although caries ultimately causes the death of the bone affected by it, it does not always precede the destruction of vitality in osseous tissues. The occurrence of necrosis, therefore, although it may result as a consequence of caries, is not necessarily dependent upon it.

When the parietes of the antrum or alveoli are affected by

necrosis, the soft parts in contact with the diseased or dead bone, inflame, ulcerate and discharge a fetid ichorous matter. The gums sometimes become gangrenous and slough. The destruction of the vitality of the osseous parts often progresses very slowly, and thus piece after piece is exfoliated until the disease is arrested.

Besides these affections, it not unfrequently happens that the osseous parietes of the antrum, are so softened as to be easily bent. This alteration of the bone, as well as the others just noticed, are, in nearly every instance, preceded by some other affections of this cavity.

The annoyance occasioned by caries and necrosis of the bony walls of this cavity or of the alveoli, to the unhappy patient, is very great. The fetor of the sanies is sometimes almost insufferable; and this matter often excoriates and inflames the parts with which it comes in contact to such a degree, as to cause them to become exceedingly sensitive and not unfrequently to ulcerate.

SYMPTOMS.

It is sometimes difficult to distinguish caries and necrosis of the bony parietes of the antrum from some of the affections that seat themselves within this cavity. They therefore often exist for a long time without being suspected. The signs that indicate mollities ossium or softness of the walls of this cavity, are such, as not to be easily mistaken for those of any other affection. In this disease, the walls of the sinus yield to pressure, and regain their former shape when the pressure is removed. Its existence, therefore, may always be known by these signs, and as these are sufficient, it is not necessary to enumerate any of the others by which it is characterized. Caries and necrosis not being so easily detected, often make considerable progress before their existence is ascertained. The fetor and appearance of the matter discharged, do not always furnish a diagnosis that can be relied upon, inasmuch as some of the diseases that occur within this cavity, cause its secretions to become equally as offensive, as the sanies resulting from caries or necrosis, and not unlike it in appearance. Their existence may in most instances be inferred,

from the discharge of a dark-coloured fetid sanies. The exfoliation of pieces of bone will set all doubt at rest.

Caries or necrosis may often be detected by perforating the antrum and exposing the denuded or diseased bone; or when there is an external opening, by probing it. In this way any loose or dead bone may be felt with the instrument; and the diagnosis in either case will be satisfactory.

When caries or necrosis is situated in the alveolar border, or floor of the antrum, its existence can be more readily ascertained. The occurrence of either in the alveolar ridge, causes the gums to inflame; to assume a dark purple or livid appearance; to separate from the sockets of the teeth, and frequently to slough in large pieces and expose the caried or necrosed bone. When situated in the floor of the antrum, the rough denuded bone may be easily felt with a probe or stilet, introduced through the fistula in the gums or alveolus of a tooth from which the matter is discharged.

The pain accompanying these affections does not constitute a diagnosis of much importance, since this is said not to belong to the osseous tissue, but to the soft parts that cover it.

CAUSES.

Caries, necrosis and other alterations of the osseous walls of the maxillary sinus are thought by some, to result, very frequently, from certain specific or constitutional vices; such for example, as the venereal, scorbutic, scrofulous, cancerous, &c., independently of any previous morbid condition of the soft parts. I have yet to be convinced, that disease ever occurs in an osseous tissue, except in the teeth, while the soft parts in contact with it, are in a healthy state. I am of the opinion therefore, that the contrary supposition is gratuitous. A bad habit of body or constitutional vice, may perhaps, increase the susceptibility of the bony tissues of the body to morbid impressions, but I do not believe that it ever gives rise, independently of the condition of the soft parts with which they are connected, to actual disease in them.

The immediate cause of caries and necrosis of the osseous walls of the antrum maxillare, is the destruction of their periosteum, caused by inflammation or ulceration. These last may result from a purulent condition of the secretions of the mucus membrane of this cavity, engorgement, abscess, from the presence of foreign bodies, tumors, a blow upon the cheek or from other kinds of mechanical violence. They may also result from the irritation produced by diseased teeth. The pressure of incarcerated fluids may perhaps be regarded as the most frequent cause; and from this too, results some of the most aggravated forms of disease that ever attack the maxillary sinus.

A morbid action kept up in the periosteum for a long time, by ulceration of the lining membrane, or any other aggravated form of disease in the sinus, or neighbouring soft parts, is apt, especially in bad habits, to result in caries of the bone, but when the inflammation is so severe as to cause the immediate destruction of the periosteal tissue, necrosis at once takes place.

The softening of the bone seems to be the result of the action of some solvent fluid upon it, capable of decomposing or breaking down its calcareous molecules. Although inflammation and ulceration are always present, and appear necessary to the exudation of this fluid, its production nevertheless, seems to be dependent upon some peculiar state or habit of body.

Thus, it is from other affections of this cavity, that those now under consideration are attributable.

TREATMENT.

Complicated, as are most frequently, caries, necrosis and alterations of the osseous walls of the maxillary sinus, with other affections of this cavity, their cure is often difficult and generally tedious. The first indication to be fulfilled, however, in their treatment, as in the case of engorgement, and of a muco-purulent condition of the secretions of the sinus, is to obtain free egress for any fluids which may have accumulated in it. This should be effected in the manner before described, by the extraction of a molaris or bicuspid, and the perforation of the base of the cavity through its socket. In addition to this, if the disease of

the osseous tissue be complicated with any other affection of the sinus, the means necessary for the cure of the disease with which it is complicated, should at once be employed. It is not necessary here to describe the treatment of the other diseases of this cavity; inasmuch as that has already, or will hereafter be done.

Deschamps, in treating upon the affections of the osseous walls of this cavity, after stating the perforation or opening in it should be large enough to expose the seat of the disease, recommends the employment of detersive and stimulating injections, a decoction of quinine, tincture of myrrh and aloes, &c. &c. These last, he says, may be introduced as injections or by means of pledgets moistened in them. He also directs the cavity to be "cleared of all foreign matter which may have obtained admission into it." This treatment, having a tendency to promote a healthy action in the lining membrane of the sinus, will often be all that is required. It should be continued until the caried or necrosed bone has exfoliated, and the secretions of the antrum cease to exhale an offensive odor. The dead bone, however, having exfoliated, a cure is generally soon effected.

It sometimes happens that the disease of the bone has been produced by some very malignant and incurable affection of the soft parts. In that case, the resources of art, will of course, prove unavailing. When the disease of the bone has extended itself to the greater part of the superior maxillary and the bones with which it is connected, as for example, the nasal, palatine, orbital, &c. the most that can be hoped for, from the skill of the physician, is a palliation of the symptoms. Art, in such cases, can seldom effect a cure. There are other cases in which it can only retard the progress of the disease, or assist nature in her efforts to separate the dead from the living bone.

It is impossible to lay down rules for the treatment of alterations of the walls of the maxillary sinus, from which it will not be necessary occasionally to deviate. It will be sufficient to state, that in those cases, where they are extensively involved in caries or necrosis, it will be proper, in addition to perforating the base of the sinus, if by this means the dead bone cannot be so exposed as to enable the surgeon to detach it from the living, to cut away

the whole of the alveolar border beneath the cavity, or to penetrate the sinus above it, or even, as Deschamps recommends, "through the cheek itself, whether there be an ulcer penetrating these parts or not." Having by this means exposed the necrosed bone, it should be carefully detached from that which is sound, and removed. By this, the disease interiorly will be more fully exposed, and a better opportunity afforded for applying such other remedies as its peculiar nature may call for. It is important that the sinus should be kept clean, and the air kept from it, and whenever any loose pieces of bone are discovered, they should be removed. Their exfoliation should not, as is justly remarked by the author last quoted,* be hastened, by improper interference, unless the state of the patient's health be such as to render it absolutely necessary, for by so doing, a piece of bone that is still attached to the soft parts may be broken. While this should be carefully avoided, all dead pieces, isolated from the soft parts, should be detached from the sound bone with which they may be connected, and removed.

The character which the affections of this cavity put on, being determined by the state of the constitutional health, or some particular vice of the body, it often becomes necessary, in their treatment, to have recourse to general remedies. If the subject be of a serofulous or scorbutic habit, or is affected with any specific constitutional vice, such remedies as are indicated by the affection of the general system under which he may be labouring, should be employed. It is not necessary to describe the signs by which the various habits of body and constitutional vices are designated, nor is it essential to point out the curative treatment respectively required by each. Full and ample directions upon these subjects will be found in works devoted especially to the affections of the general system.

Although the character and malignancy of the disease are determined by the state of the constitutional health, or disposition of body, its occurrence seems to be dependent upon local irritation. Its continuance, in many instances, results from this; and

* *Traite des Maladies des Fosses Nazales*, chap. iv. p. 231.

the cure, in cases of this kind, soon follows the removal of the cause that gave rise to it. In a case, the history of which I am now about to detail, an example of this sort is furnished.

CASE 19th. L. S——, a maiden lady of about thirty years of age, of a scorbutic habit, had been affected with pain in her left cheek and alveolar ridge of the upper jaw of the same side, for nearly two years; which at times, had been almost insupportable. Nearly all her teeth were affected with caries, and from between the necks of several, on the left side in the superior maxillary and gums, a fetid sanies had been exuding for two or three months. Her appetite had become greatly impaired, and a tumor half the size of a black walnut, having formed upon the palatine arch of the affected side, she became alarmed, and in the fall of 1840, came from her residence on the Eastern Shore of Maryland, to Baltimore, in pursuit of medical aid. She applied to Professor T. E. Bond, who, after investigating her case, and satisfying himself that the affection of the face and mouth was the result of the diseased condition of her teeth, advised her to place herself under my care; which she did on the following day.

The alveoli of four of the teeth of the affected side, in the superior maxillary, were on examination, found to be in a necrosed condition, as was also a part of the palatine bone of the same side. The gums around these teeth had separated from the alveolar processes, and had a dark livid appearance. A thin dark coloured, ichorous matter, which when brought in contact with silver, almost instantly turned it black, was constantly exuding from between them and the necks of the teeth. The left nostril was dry, and the opening from the sinus into it had evidently closed. An exceedingly fetid matter had been discharged from it during the early stages of the disease. The tumor on the left, side of the arch of the palate, was soft and elastic. When pressed, a dark coloured sanies was discharged from the alveoli, and it for a time, disappeared.

The alveolar processes being in a necrosed and loose condition, it was with some difficulty I succeeded in removing the bicuspides and the first and second superior molares of the left side, without bringing their sockets with them. The operation was

followed by the discharge of a considerable quantity of fetid sanies; and, in a few days, the alveoli having become completely detached from the sound bone, I removed them, together with a part of the floor of the antrum. The opening thus formed into this cavity was large enough to admit the end of the forefinger. Several small pieces of bone were afterwards exfoliated, from where the teeth had been extracted, and three pieces from the left side of the palatine arch.

Without any other treatment, the place from which the teeth and alveoli had been removed, except the opening that communicated with the maxillary sinus, had in about seven weeks become entirely covered with firm and healthy granulations. From the opening into the antrum, a fetid matter was still discharged. This became less and less offensive, until at the expiration of six or eight weeks more, the opening into the nose having become re-established, it lost its fetid odor, and the aperture at the base of the sinus soon after closed.

Thus, in a little more than three months, a complete cure was effected. The patient left the city in the following spring, and I have not since heard from her.

The following case is taken from Bordenave's *Observations on the diseases of the antrum maxillare*, as published in the "*Memoirs of the Royal Academy of Surgery*.* Although in the translation as here presented, it is considerably abridged, no important fact connected with it, has been omitted.

CASE 20th. A man, whose right superior maxillary at the upper part, had been swollen for about three months, had at the same time, a soft tumor on the interior of the palate, which, on being pressed, caused matter to be discharged from the nostril of that side. These affections, together with tumefaction of the gums, looseness of several of the teeth, and a fetid breath, induced M. Planque, under whose care the patient was placed, to suspect suppuration of the maxillary sinus, complicated with scorbutic diathesis of the general system. The molares, which only ad-

* Another interesting case is given by Bordenave, which the author has given in his treatise on the diseases of the Maxillary Sinus, page 114.

hered to the gums, having been extracted, matter was discharged through their alveoli. A portion of the maxillary bone was now discovered to be carious, and this, in about a month began to loosen, and a piece of about an inch and a half long, and half an inch in width, some time after exfoliated. The tumor exteriorly disappeared; the walls of the sinus approximated, and a cicatrix ultimately closed the opening.

The details of many similar cases are on record, but it would be extending the limits of this part of my work too far, to introduce them here. The history of the cases already given, will suffice to illustrate the treatment of these affections. I should, however, have given a case of *mollities ossium* of the walls of this cavity, had I not, while treating of ulceration of the lining membrane, quoted one in which that affection had become complicated with this.

It sometimes happens when a very large opening has been formed through the inferior part of this cavity, it does not always readily close. This does not often occur, except the natural opening has become obliterated. When the parts do not manifest a disposition to unite, the practice introduced by *Bordenave* and *Seultet*, which consists in cauterizing the interior circumference of the opening, will, in most instances, prove successful. If this and all other means fail, the opening should be closed by means of an obturator of fine gold. This should be accurately fitted to the parts, and secured by means of a broad clasp, to a molar or bicuspid tooth, and if there be none suitable on the side of the mouth to which it is to be applied, the gold should be extended to one on the opposite side. If it be necessary to replace the teeth lost, with artificial ones, these may be so mounted that the plate upon which they are set, shall cover the opening into the maxillary sinus, and thus obviate the necessity of any other obturator.

CHAPTER SEVENTH.

TUMORS OF ITS LINING MEMBRANE AND PERIOSTEUM.

THE lining membrane and periosteal tissue of the maxillary sinus occasionally become the seat of fungous and other tumors, and in consequence of the concealed situation of the cavity, morbid productions originating in it, often, as has been previously remarked, make considerable progress before they attract attention; hence, the efforts of art for their cure, which might otherwise frequently be successful, in most instances prove unavailing. The presence of a tumor may give rise to all the diseases to which its osseous walls are liable, as well as to most of those incident to its soft tissues. As soon as a morbid growth has filled the sinus, it, as it continues to augment in size, presses upon the lining membrane, and excites inflammation and sometimes ulceration, and causes its secretions to become vitiated. A diseased action is communicated to the periosteum of the surrounding osseous walls; it ceases to furnish them with the healthy juices which they require for their preservation; thickens, ulcerates, and is destroyed, or exudes a corrosive fluid. The bony parietes of the sinus are softened or become affected with caries or necrosis, and one or more fistulous openings are formed through the cheek, alveoli, or palatine arch.

These are not the only effects that result from tumors situated in this cavity. As they increase in volume, after having filled the sinus, they gradually distend and displace its bony parietes; the floor of the orbit is sometimes elevated, and the eye more or less forced from its socket; the palatine arch and alveolar ridge are depressed, the teeth become loosened and drop out, and when the tumor is of a soft fungous nature, it not unfrequently escapes through the alveoli into the mouth, and after forcing the jaws

asunder to their greatest extent, protrudes from it in enormous masses. Bertrandi gives the history of a case of polypus excrescence of the antrum, which after having destroyed the palate, anterior part of the maxillary bone, and filled the mouth, forced itself up into the orbit, elevated its roof, pressed upon the brain, and ultimately occasioned apoplexy and death. Other similar cases are on record. Mr. Cooper says there are three specimens of diseased antrum in the museum of London University College.

The tumor in two of these, had "made its way from the antrum to the brain." The third was taken from a patient of his, which had died. The tumor in this case, which was of a medullary and scirrhus character, forced itself up into the orbit, displaced the eye, and ultimately caused the death of the patient. The same author mentions another case, the subject of which was a boy in St. Bartholomew's Hospital, who had a tumor of the antrum which "made its way through the orbital plate of the frontal bone and cribriform plate of the ethmoid into the cranium," and though the portion of it that entered the brain was as large as a small orange, he says the boy was only in a comatose state about forty-eight hours previously to his death.

Tumors occupying the maxillary sinus do not always originate in its lining membrane or periosteum. They sometimes arise from the pituitary membrane of the nose, frontal sinus, or ethmoidal cells, and after having found their way into this cavity, augment in size, until they produce the effects just described. Some suppose that the morbid productions found here, originate more frequently in the cells of the ethmoid bone, than in the lining membrane of this cavity.* I am disposed to believe that this opinion is not well founded, and that it has chiefly resulted from the great liability of most kinds of tumors of the maxillary sinus, to be reproduced after having been extirpated,—which is often attributable to the continuance of the cause that gave rise to them in the first instance, or to their imperfect removal. That they do, however, sometimes originate in the ethmoidal cells, there can be no question.

* Vide, *Traite des Maladies de la Bouch*, t. i. p. 210, &c.

It sometimes happens that tumors having their seat in the antrum, after having filled it, make their way into the nose, where they acquire a size equal to, or even greater than that which they had previously attained, thus dividing themselves, as it were, into two parts—one occupying the antrum, and the other, one of the nasal cavities. Occurrences of this sort are not unfrequent, and they sometimes lead to the adoption of an incorrect opinion, with regard to the real seat of the disease. Thus a polypus of the antrum is occasionally mistaken for one of the nose, and the error frequently not discovered, until an attempt is made to remove it.

The character of morbid growths in this cavity is exceedingly variable, as much so as is the state of the constitutional health of different individuals, and the causes that give rise to them. They not only vary in their appearance and structure, but they vary in their malignancy. Some are of a healthy flesh colour, soft, sensible, but not painful, and present a smooth, regular surface; others varying in their consistence from hard to soft, and in their colour from a pale yellow to a deep red or purple, present a rough, irregular, and not unfrequently ulcerated surface, and are more or less sensitive to the touch. Some have their origin in the mucus membrane, and others, both in this, and the periosteum. Some are attached by a broad base, and others, only by a mere peduncle.

As it regards this latter description of tumors, which are usually designated by the name of polypi, their occurrence in the maxillary sinus is questioned by some writers. Sir Benjamin Brodie does not believe that they ever form in this cavity;* and in this opinion Mr. S. Cooper fully concurs; but that they are occasionally met with here, seems nevertheless to be pretty conclusively established. A case described by M. Bertrandi in his treatise on Operative Surgery, page 369, has already been referred to, and Bordenave, in his observations on the diseases of the antrum maxillare, gives the history of a case treated by M. Doublet. Rusch declares that he has twice seen polypus of this

* Vide, London Medical Gazette, for December, 1834. p. 850.

cavity, and Petitt, Levrette and other writers also affirm that they have witnessed polypi here.* The occurrence then of polypi in the maxillary sinus, although very rare, it must be admitted, does sometimes happen. Other descriptions of tumors are certainly more frequently met with in this cavity. Of these, some are of a simple fibrous, sarcomatous, or osteo-sarcomatous nature,† and when thoroughly extirpated, are seldom reproduced; others are of a medullary, cancerous, or carcinomatous character. These last, although originating in the mucus membrane, if long neglected, are very liable to be reproduced after their removal and generally occasion the death of the patient.

It sometimes happens that several fungi, and from opposite and various points in this cavity, spring up. The chances of cure, when this is the case, especially if they are of a malignant character, are greatly lessened.

Tumors in the maxillary sinus seldom grow very fast during the early stages of their formation; but, as they enlarge, the neighbouring parts become involved in the diseased action, and consequently furnish them with fluids less healthy in their qualities, and thus cause them to assume a character of greater malignancy, and generally to increase more rapidly in size.

Having premised these few general observations on tumors of the maxillary sinus, I shall proceed to describe the principal signs by which their existence is indicated.

SYMPTOMS.

The occurrence of tumors in the maxillary sinus is rarely accompanied previously to their having obtained a size sufficiently large to fill it, by symptoms differing materially from those occasioned by many of the other affections that locate themselves here. After they have filled the sinus, the indications soon become less equivocal. Swelling of the cheek, depression of the

* Vide, *Traite des Maladies de la Bouch*, tom. 1, p. 212, and *sur cure des Polypes de la matrice, de la gorge, et du nez*, page 253.

† Vide, Professor Reese's Appendix to Cooper's *Surgical Dictionary*, American edition, 1842.

palatine arch and alveolar ridge, loosening of the superior molar teeth of the affected side, inflammation and sponginess of the gums, elevation of the floor of the orbit, and protrusion or concealment of the eye, are symptoms which result from the presence of tumors in this cavity, but they are not peculiar to these affections alone; many of them are produced by mucous engorgement of the sinus. When to these is superadded the discharge of a bloody sanies from the nose, or from one or more fistulous openings through the cheek, alveolar ridge, or palatine arch, the diagnosis will be conclusive; and the existence of a tumor in the antrum will be established beyond doubt.

There are also other signs by which the occurrence of a morbid growth in this cavity may be known; as for example,—the dropping out of the superior molares of the affected side, and the protrusion of portions of the tumor through the alveoli.

The pain is seldom severe until the tumor has filled the cavity, except the excrescence be from its inception, of a malignant character; as it augments in size and forces the walls of the sinus asunder, it becomes more and more severe. Sometimes, during the progress of the disease, it becomes almost excruciating. In a case of fungus hæmatodes of this cavity, which the author, a few years since had the opportunity of witnessing, the patient was in the habit of taking upwards of two tea-spoonsful of black drop at a time, for the procurement of ease and sleep.

In addition to the foregoing symptoms, several of the affections already treated on, together with all the effects produced by them, not unfrequently result from tumors in this cavity. Inflammation and ulceration of its lining membrane, a purulent condition of its secretions, caries, necrosis, and a softening of its osseous walls, seldom fail to follow some of the stages of the formation of the morbid productions under consideration. It is unnecessary to mention the symptoms peculiar to each variety of tumor, as they are given by writers on general surgery.

CAUSES.

Most writers on the affections of the maxillary sinus, are of opinion that tumors in this cavity result spontaneously, as a consequence of some specific constitutional vice, independently of local causes. I do not, however, believe that they are ever thus originated. That a bad habit of body, or some constitutional vice is necessary to the production of the affections under consideration, I do not doubt, but that this is capable of giving rise to them in parts uninfluenced by local irritation, I think exceedingly questionable. Having, however, already expressed my views with regard to the agency exerted by particular habits of body and constitutional vices in the production of diseases in this cavity, it will not be necessary to repeat what I have before said upon this subject. It will be sufficient to remark that most, if not all of the morbid excrescences met with, result from local irritation and constitutional vices; and that both are necessary to their production.

Scorbutic and serofulous habits, and persons whose general health has been impaired by certain constitutional diseases,—such as the venereal, protracted inflammatory and bilious fevers, dyspepsia, &c., are most subject to tumors of the maxillary sinus. Every thing in fact, which has a tendency to increase the irritability of the soft tissues of the body may be considered as so many predisposing causes. The local causes are the same as those of most other morbid affections of this cavity. Diseased teeth, gums and alveolar process are probably among the most common. The irritation produced by these, so frequently extends itself to the antrum, that their agency in the production of tumors here, cannot be questioned. There are, however, other causes of irritation to which this cavity is exposed, as blows upon the cheek, wounds, &c.

TREATMENT.

It is only in the early stages of the formation of tumors in the maxillary sinus, that surgical treatment can be adopted with success, and even then, their entire extirpation is necessary. If this

be not accomplished, a speedy return of the disease may be expected. But, preparatory to the removal of the diseased structure, a large opening should be made into the antrum, so as to expose as much of it as possible; and with regard to the most proper place for effecting this, Deschamps recommends when the alveolar ridge has been started, the removal of the first or second molaris, and the perforation of the sinus through its socket with a "three-sided trocar of suitable dimensions." When the alveolar ridge and teeth are sound, he directs the opening to be made through the outer wall of the sinus above the ridge, and this he thinks, on account of its being more direct, is preferable to the other mode. An opening may be easily effected in either way into the sinus, as its walls are generally so much softened as to offer but little resistance.

When the opening is made through the external parietes, the instrument recommended by Mr. Thos. Bell, to be employed for cutting away the bone after it has been exposed, is "a strong hooked knife," which is probably as well adapted to the purpose as any that could be used. Some surgeons employ strong curved seissors, but the hooked knife I think preferable.

A free opening having been effected into the antrum, a finger of the operator should be introduced, and the nature of the diseased structure ascertained. This done, he will be enabled to determine the proper procedure to be had recourse to for its removal. If the tumor partakes of the character of those called polypi, it may be seized with a pair of forceps and torn away; if it be attached by a broad base, its extirpation will be most readily effected with a knife. Even with this, it is often exceedingly difficult to effect its total removal, so that it not unfrequently becomes necessary to employ the actual cautery; for, if any small portions be left behind, as has before been stated, a reproduction of the disease will generally very soon take place. When the disease has originated, or is seated, in the periosteum, the cautery has proved to be the most effectual means of preventing its return of any that has been tried. The French surgeons have applied it with great success. Desault, in a case of fungous tumor, succeeded in effecting a cure after three applications. The root of the disease, by the employment of this, can

often be destroyed, when less effectual means would fail. But it is important when it is had recourse to, that it should have such a degree of heat, as to accomplish this object instantaneously, else the inflammation that would otherwise be excited by its application in the surrounding parts, would greatly retard, if it did not prevent the cure. The remarks of Mr. Thomas Bell upon this subject, who says, "the white heat should be employed," are worthy of attention.

In remarking upon the bold practice of the French surgeons in the treatment of these affections, the author just quoted says, it "is worthy of our praise and imitation;" and, continues he, "the timidity which, until very lately, almost excluded the use of the actual cautery in this country, has been one cause, and that a very prevalent one, of failure in the treatment of some of these cases; but it is not so easy to account for the still more culpable dread, which has in so many instances prevented any attempt from being made to extirpate the disease; a degree of pusillanimity which is at once an opprobrium on the profession, and a fatal injustice to the sufferers, who thus abandoned to the unrestrained progress of the disease, are left to perish by a lingering and most painful process, without even an attempt being hazarded for their relief."

The foregoing comparison, instituted by Mr. Bell, between the practice of the French and English surgeons in the treatment of tumors of the maxillary sinus, is certainly correct. It is due to truth to say, that the bold practice of the former has been fully and successfully emulated by American surgeons. Dr. A. H. Stevens, Professor of Surgery in the University of New York, in 1823, in a case of fungous tumor, attached by a broad base to the lower part of the antrum, removed a large portion of the lower and anterior parts of the upper jaw. The patient recovered and is said to be living at the present time.* In 1841, Dr. J. C. Warren, of Boston, for a case of cephalomatous tumor of this cavity, removed the superior maxillary bone. This operation also, was successful.† The same operation was performed

* Appendix to Cooper's Surgical Dictionary, p. 30.

† Boston Medical and Surgical Journal for 1842.

soon after, and for the removal of a tumor of the antrum, with success, by R. D. Mussey, of Cincinnati, Ohio;* and Dr. Fare, of Columbia, South Carolina, has performed the operation twice with success.

The operation for the removal of the superior maxillary, did not originate with American surgeons; Velpeau says it was performed by Acoluthus in 1693, for a tumor of the face.† By reference, however, to the history of the case as given in a memoir of the Academy of the Curiosities of Nature,‡ it will be perceived that the tumor originated in the maxillary sinus, and that only a part of the jaw-bone was removed. If, however, we can believe Wiseman, this most formidable operation was performed at a still earlier period. He says in his surgery, the first edition of which was published in 1676, "That he cut into a man's cheek, sawed in pieces the alveolus, and took out the whole jaw, and cured him."|| Although the operation may have been performed thus early, it does not at all detract from the credit due to modern surgeons, since the method of effecting it, is at least, original with them.

Thus it is perceived, that the diseases under consideration not unfrequently call for one of the most formidable operations in surgery, and that by it, many unfortunate sufferers have been snatched from the very jaws of death. Notwithstanding the performance of this operation, the application of the cautery often becomes necessary to prevent a reproduction of the excrescence, and there are many cases in which it cannot be repressed by this. The result of the most thorough and best directed treatment depends on the state of the constitutional health and the nature of the disease. In depraved habits and shattered constitutions, if the tumor be of a carcinomatous character, a cure need never be expected.

The hemorrhage, during the operation for the removal of tumors of the antrum, is sometimes so profuse as to require very

* Western Lancet for 1842.

‡ Decad 3, ann. 40. Obs. 57.

† Velpeau's Operative Surgery, p. 263.

|| Vide, Wiseman's Surgery, page 285.

prompt and active means to arrest it. It may generally, however, be controlled by the employment of compresses and suitable styptics; should these fail, the actual cautery must be had recourse to.

The history of the following cases promiscuously taken from various works, will perhaps furnish a more correct idea of the methods of treatment most proper to be pursued, than any description which could otherwise be given. The first three cases are taken from the *Memoirs de l'Academie Royale de Chirurgie*.*

CASE 21st. A man about thirty-five years of age, had a fleshy tumor the size of a large pea, situated in a space formed by the decay of the first and second superior molares of the left side. This tumor caused a dull pain; it was excised, and the actual cautery applied to arrest the bleeding and destroy remaining portions of the excrescence. It re-appeared, and three months after was double the size of the former, and impeded mastication. The two decayed teeth were loose and the others were painful; and a fetid matter escaped through the nose and mouth.

After the extraction of the two decayed teeth, M. Dubertrand, discovering that the tumor had its seat in the antrum, seized it with polypi forceps and brought the whole of it away. After the extraction of the tumor, the opening through the alveolus was large enough to admit the little finger. M. Dubertrand next destroyed such portions of the alveoli and maxillary bone as were decayed. After the extirpation of the tumor, he found it necessary to introduce a plug of cotton into the antrum, to arrest the hemorrhage that followed the operation.

The secretions of the maxillary sinus ceased to exhale an unpleasant odor, in three days they became healthy, and in less than one month, the patient was restored to health, and the opening from the mouth into this cavity was closed with firm granulations.

The tumor just described was of the simplest kind, but had it not been completely eradicated, it would doubtless have soon re-appeared.

* Tome 13, obs. 1, 5 and 7th, pp. 372, 387, and 424.

CASE 22d. Acoluthus, reports the case of a woman thirty years of age, who in 1693, came to Pologne in Silesia, in search of aid for a peculiar disease of the antrum, under which she was labouring. Some time after the extraction of a tooth from the left side of the upper jaw, a small tumor appeared in its alveolus, and made such progress, that in two years, it attained the size of a double fist. It occupied nearly the whole cavity of the mouth, and distended the jaw to such a degree that it was feared it would rupture it. The lower jaw was depressed, the lips could not be made to meet, and the tumor increased so fast, that in a few weeks, the woman's life was despaired of—she being threatened with death from suffocation, hunger and thirst. Under these circumstances, Acoluthus determined to attempt a cure.

The tumor was very hard and occupied the greatest part of the palatine arch; the upper teeth of the left side were in its centre. The operation was commenced by enlarging the mouth, beginning at the commissure of the lips, and passing it transversely through the cheek. This enabled Acoluthus to attack the exterior of the tumor with a curved bistory. The excrescence was as hard as cartilage and scarcely yielded to cutting instruments applied by a strong hand. He, however, succeeded in bringing three or four teeth, together with a portion of the superior maxillary bone. The operation as yet had extended only to the exterior half of the tumor; the other which filled the palatine fossa, he says, it was impossible to bring away. The removal of that was effected only by piece-meal and at different times. The operation was long, laborious and very painful. The actual cautery was applied to the bleeding vessels and fungous flesh. The appearance of the patient, a few days after the operation, was such as to inspire hope for a favourable termination of the disease. The actual cautery was applied several times, and finally there were no indications of a re-appearance of the excrescence, except at the point where it had first originated. Some portions of bone, were afterwards found to be carious, and the removal of these was followed by a prompt and speedy cure.

This was the operation alluded to by Velpeau, as embracing the removal of the superior maxillary, previously noticed, but

from the description here given of it, it would appear that only a small portion of the bone was taken away. The alveolar ridge and anterior parietes of the sinus was all that was removed. The history of the case, however, imperfect as it is, and the result of its treatment, proves that the resources of art are adequate to the cure of many of the most formidable of the affections of this cavity, if their employment be not delayed too long.

Another case, taken from the memoirs of the Royal Academy of Surgery, is given by the author in his dissertation on the diseases of this cavity; for the particulars of which the reader is referred to page 131 of that paper.

CASE 23d. A young lady of Picardy having been exposed to the changes of weather for three years, in attending to business which required of her to be much on horseback, experienced, at the end of the first year, a chilly sensation in her left cheek; this increased, and her cheek became swollen, and her molar teeth of the affected side loosened and two dropped out.

The swelling of her cheek increased, and she was affected with lancinating pains in that side of her face; her breath became offensive and she lost two more teeth. Becoming alarmed, she went to Rouen to obtain medical advice. Receiving no satisfaction, she went to Paris, and applied, November 20th, 1740, to M. Croissant de Garengeot, who found her face greatly disfigured. Her mouth, he says, was on the right side, the left side of her nose much elevated, the left cheek very large, and the upper lip of the same side greatly thickened. Bluish flesh of the size of an olive occupied the alveoli of the teeth which had dropped out, the left side of the roof of the palate was thrown inwards and resembled the exterior projection of the cheek. The anterior wall of the antrum had become softened as well also as that of the left nasal bone, and the whole cavity was filled with fungous flesh.

M. Garengeot commenced the operation by seizing the bluish excrescence which had appeared through the alveoli with a hook and cutting it away; and he says he incised transversely, every day, from within the mouth, the buccinator muscle, and brought away part of it as well as the flesh which so much augmented the size of the jaw.

The hemorrhage was so abundant that it was impossible to proceed further with the operation. The excrescence was rapidly reproduced after each operation; these excisions were repeated seven or eight times in six weeks, and the hemorrhage, each time, was very great. The seat of the disease was in the anterior of the sinus. The fungous flesh contained in this cavity was removed, as well also as some osseous projections.

The excrescence continuing to be produced, the patient no longer refused to have the actual cautery applied, its use was resorted to, twice a day, for eight days. The success, says M. Garengeot, which followed this treatment, was incredible. The flesh soon took on a healthy consistence, the palatine arch returned about two-thirds to its natural situation, and the bad odor of the mouth gradually disappeared.

The application of the cautery was continued, once a day, for three weeks, and the patient did nothing more than to use a slightly stimulating and astringent gargle. On the 20th of March she returned home cured.

It is very probable that had the operation in the case just described been thorough, there would have been no return of the disease, for it is evident from the description which M. Garengeot gives of the operation, that the seat of the affection was not reached until it had been repeated seven or eight times; and then, I think it very likely, not until he had recourse to the actual cautery.

The utility of the actual cautery, not only for the purpose of thoroughly destroying every remaining vestige of fungous tumors of the antrum maxillare after their removal, but also for the suppression of hemorrhage, would seem to be fully established by the result of the treatment of cases twenty-two and three. That there are cases where it will fail to prevent their reproduction there is no question, but this does not detract from its value.

The employment of arsenical preparations has, in some instances, been found highly advantageous in repressing the growth of fungous excrescences. The following case is cited by Mr. Thomas Bell as an example.*

* Anat. Phys. and Diseases of the Teeth, p. 283.

CASE 24th. "James Woodly was admitted into Guy's Hospital, September 4th, 1821, for a fungous exostosis, which arose from the antrum maxillare, and made its way through the palate. After his admission he had the fungus removed two or three times, and a variety of caustic applications were afterwards made use of; notwithstanding which the tumor re-appeared. At length Sir A. Cooper, after having made an incision from the corner of the mouth outwards through the cheek, removed the tumor from a greater depth than had previously been effected. After this operation the wound in the cheek readily healed, and the following strong solution of arsenic was daily applied to the part from whence the tumor had been removed.

R. Arsenic, oxyd. alb. ʒ vi.
Potass. Subcarb. q. s.
Aq. Distillat. M. ft. solutio.

The solution required to be diluted in the first instance on account of its occasioning him a good deal of pain, in a few days, however, he used it of the strength mentioned in the formula. It was applied regularly every afternoon, after which he did not take any food until the following day. At the time of its application he had a piece of oiled silk, of a horse-shoe shape, passed into the mouth, its sides being turned up to prevent the solution escaping into the mouth: his head then hanging down over a basin, a piece of sponge moderately saturated with the solution was applied to the disease upon the oiled silk, pressed against the part; such of the solution as was then pressed out, passed along the channel of the oiled silk into the basin over which the head was hanging, and the saliva escaped behind the oiled silk into the same utensil. He kept the sponge in this situation until it gave him considerable pain, when it was removed and the mouth carefully washed. He suffered great pain in his mouth during the period of cure; but the arsenic did not produce any other unpleasant symptoms. This application was continued for a few weeks, at the end of which time he was completely cured; a cavity being left in the site of the tumor, which however, gra-

dually became covered by a continuation of the membrane which naturally lines the palate."

There are a number of highly interesting cases of sarcomatous, carcinomatous, and other kinds of tumors of the maxillary sinus, in Jourdain's Treatise on the Surgical Diseases of the Mouth; some of which, I had intended to introduce into this treatise, but apprehending that it would extend it to too great a length, I have concluded to omit them. A number of equally interesting cases reported in various other works,* are for the same reason excluded.

Before dismissing this branch of the subject, I will add the history of one more case of tumor of this cavity, taken from the "Boston Medical and Surgical Journal," the treatment of which, involved the removal of the superior maxillary bone, given by that justly distinguished and eminent surgeon, J. C. Warren, M. D. of Boston, and although it is of considerable length, the method of procedure is so minutely detailed, that it furnishes a more correct description of the operation, than any which could otherwise be given.

CASE 25th. "The patient, Mr. J. G." says Dr. Warren, "is 35 years old, well constitutioned, and in every particular strong and healthful, with the exception of the disease which called for this operation. About nine months since he began to be affected with frequent and considerable bleedings from the nose. These bleedings occurred about once a week, were sometimes profuse. During the occurrence of one of these attacks, he was led to pass the finger deep into the left nostril, and discovered there a tumor about the size of a pea, in the outer side or wall of the cavity.

* Vide, Journal de Chirurgie, tom. i.; Parissian Chirurgical Journal, tom. i.; Œuvres Chir. de Desault, par Bichat, tom. ii.; New London Med. Jour. vol i.; Eichorn. Diss. de Polypis in Antro. Highmori. Trans. of a Society for the Improvement of Med. and Chir. Knowledge. Recueil Periodique de la Soc. de Med. tom. ii.; No. 9. Edinburg Med. and Chir. Jour. Nos. 83 and 84; Traite des Maladies Chirurgicales, tom. vi.; Traite des Maladies des Fosses Nazales; New York Jour. of Med. and Surgery; Western Lancet; Cooper's Surgical Dictionary; Benj. Bell's Surgery, vol. iv., &c. &c.

The bleedings continued and the tumor grew, till it made a visible appearance in the aperture of the left nostril. Alarmed at this, he consulted Dr. Winslow Lewis, who, suspecting a formidable disease, advised him to apply at the Massachusetts General Hospital for advice and assistance. He was there examined by Dr. Hayward and myself, and presented the following appearances. The left nostril was filled by a tumor of a deep red colour and soft consistence, discharging blood freely on being subject to a slight touch. A probe could be introduced into the cavity on the inner side of the tumor along the septum of the nose; but, on the outer wall, was soon arrested in its progress by the tumor, which appeared to be connected with this part, and bled so copiously as to prevent a continuance of the examination in this direction. The external appearance of the face being examined, the nose was seen to be tumefied on the left side by the protrusion of the nasal process of the upper jaw, and also by that part of the bone forming the exterior wall of the nasal cavity. On opening the mouth, the hard palate was seen to be the seat of a tumor of an elastic character, oval form, and size sufficient to occupy a considerable portion of this cavity, obviously produced by the pressure of a substance in the nostril above. The mucus membrane of the mouth was not altered in colour or consistence.

On passing the finger through the mouth into the posterior opening of the nostril, this aperture was found to be filled by a soft elastic tumor, similar to that which occupied the anterior aperture. The septum of the nose was slightly inclined into the right nostril.

Such were the history and appearances of this tumor. Its vivid red colour, soft consistence, disposition to bleed, rapid growth, and consequent breaking down of the bones which surrounded it, satisfied me that it was a cephaloma, a malignant fungus, which would destroy the patient's life in a short time unless extirpated: and I, therefore, advised him to enter the hospital, and have it removed. The patient agreed to this course, and went home to make his arrangements.

In nine days after, he entered. When I came to examine the tumor again, I found that, during this short period, it had enlarged considerably; and especially that it had extended to the right

side of the palate so far as to leave a small space only between it and the teeth of that side. I was now seriously apprehensive that no operation could wholly eradicate the tumor, and felt much doubt whether it would be expedient to attempt one, in itself always severe, and which in this case would be attended with dangerous bleeding. After weighing the arguments on both sides for three or four days, I came to an affirmative conclusion, provided other gentlemen were of the same opinion. On the Saturday following, the 4th of December, a consultation was held, consisting of Drs. Hayward, Townsend, and Holmes, and these gentlemen being satisfied that as there was no other ground of hope for the patient, and that he must die in a most distressing manner, the operation was decided on, and immediately after executed.

The principal difficulties I anticipated in this operation were the following:—1. Profuse bleeding, which the character of the tumor, the tendency of blood to the head produced by it, and the fulness of the patient's habit, seemed to promise. 2. Impracticability of dividing the bones without sawing, as the patient was of an aspect which indicated unusual solidity of the osseous texture. 3. Fatal syncope, from the quantity of blood lost and the pain of the operation.

To obviate these dangers I proposed—1. Compression of the carotid arteries, tying of the wounded vessels when they bled freely, and the use of the actual cautery. 2. Division of the bones by the cutting forceps, which I had caused to be made and used for the last twenty years. 3. Waiting occasionally to give the patient time to recover, and recruiting him with cordials.

Every thing being arranged, the patient was placed in a chair, his head well supported, and the operation was then begun in presence of the medical class and a considerable number of medical gentlemen of the city.

I made an incision from the middle of the external edge of the left orbit to the left angle of the mouth, down to the bone. A most copious gush of blood succeeded. The internal flap was then quickly dissected up to the middle of the nose, cutting up at the same time the cartilage of the left wing of the nose, and freeing the globe of the eye from the inferior part of the socket by the division of the inferior oblique muscle, the fascia of the

eye, and the periosteum. The outer flap was then rapidly dissected from the os malæ and os maxillæ, and around the latter bone as far as its union with the pterygoid process of the sphenoid; but the uniting space was not at this time penetrated on account of the large pterygoid branch of the internal maxillary, which would have been difficult to secure in this stage of the operation.

The two flaps being separated, the anterior extremity of the sphenomaxillary fissure was perforated, and I then proceeded to the division of the bones. The os malæ was attached directly opposite to the perforation in the sphenomaxillary fissure. The cutting forceps were then applied to the broadest part of the malar bone, and divided it smoothly in a few seconds. Second, the same instrument was applied at the internal angle of the eye, in an oblique direction from the lower edge of the orbit to the lower termination of the os nasi. Here the projection of the tumor into the orbit occasioned some difficulty, from the little space left for its introduction into the orbit; but, the instrument being fixed, the bone was divided without difficulty.

In the meantime the blood continued to flow in torrents. One considerable artery required immediate ligature: and the bleeding of the others was controlled by compression of the carotid artery. The mouth of the patient filling with blood, frequent pauses were required to afford him an opportunity of ejecting it, and occasionally he was recruited by a little wine.

The most difficult part of the operation remained; that of dividing the sound from the unsound parts within the mouth, and separating the maxillary from the sphenoid and palatine bones without injury to the latter; so as to leave the patient the whole of the soft palate, with the palatine plate of the os palati, to support it. In order to accomplish this without dissection, I made an incision through the mucous membrane of the hard palate, beginning at the edge of the palatine plate of the os palati, and extending the incision forwards to the external edge of the jaw, then upwards across the alveoli into the bone. To facilitate this incision, the middle incisor tooth of the left side was taken out in such a way as to break the anterior part of the alveolus. Then by a single stroke of the cutting forceps the upper maxillary bone was

divided, and its palatine plate cut through as far as its junction with the os palati. In order to separate the palatine plates of the maxillary and palatine bones, I hoped to be able to clear the mouth of blood for a moment to make a transverse cut between these plates. But to see was impossible, from the flow of blood. Therefore, passing the fore-finger of the left hand into the mouth, I felt the last molar tooth, and turning the pulp of the finger forwards to receive and support the instrument, I struck a strong-pointed knife through the hard palate at the union of the maxillary and palate bones, separated these bones, and was able also to separate the maxillary bone from the pterygoid process of the sphenoid, and thus accomplished the disunion of all the bones concerned. Finally, the knife was passed externally behind the upper maxillary bone into the space between this and the pterygoid process, to divide the second branch of the fifth pair of nerves. This was done by a stroke of the instrument, and the patient made a great cry, evincing that this nerve had been reached.

Seizing the bone with the left hand by its orbital and alveolar portions, it was by a gradual movement started from its situation, and aided by a few touches of the knife, its remaining periosteal attachments were divided, and the whole bone and tumor dislodged from the face.

The patient having lost much blood, had now become faint, and was, therefore, placed on a table. The portion of swelled mucus membrane on the right side of the palate was cut off with ease, and it now only remained to arrest the hemorrhage. A ligature was applied to the superior ethmoidal branch or continuation of the maxillary artery. The hemorrhage from a second artery also required to be arrested. This was not easily done, for it was impossible to discover the orifice of the wounded vessel. It was, therefore, touched with caustic potash, and lint applied to it. As the bleeding might recur, the wound was not immediately brought together, but was covered with a cold-water compress, and the patient left in the operating theatre. He was able to swallow and speak, notwithstanding his exhaustion and the length of the operation.

The time expended during the operation I do not know, having

always considered it the part of folly to measure an operation by time, rather than the exigencies of the case. I was informed, afterwards, it was over forty minutes. The principal part of this time was expended in waiting for the patient to relieve his mouth and throat of blood, which appeared to embarrass him more than I had expected. But the time employed in the incisions, both of the soft and hard parts, was short, and certainly could not have exceeded ten minutes.

In three hours after the operation, no bleeding having occurred, the wound was dressed by passing five sutures and applying a cloth of four thicknesses wet in cold water, to be moistened from time to time; and then he was carried to his bed. He passed the night rather uneasily; but the next day he was more quiet. The pulse, for four or five days after the operation, varied from 80 to 112; at the end of six days it was 72. The third day, the wound being wholly united, the stitches were withdrawn by Mr. Hayward, the house-surgeon, at my request. In two or three days the patient was able to take softened bread; and, in three weeks from the operation, went home to pass the Christmas with his family—in two days after which, he was discharged. At the present time, eight weeks after the operation, he is at home, takes food freely, and speaks intelligibly. The left eye, at first much swelled, is in a natural state, and he uses it without uneasiness. On the left side of the palate there is an aperture of a triangular form. Through this, the os ethmoides may be felt, the projections of which were mistaken by the patient for a return of the disease. The food occasionally passes through this aperture into the nostrils, and embarrasses the patient momentarily. The soft palate is entire. There is a slight paralysis of the left side of the upper lip, from the division of the facial nerve; and a want of sensibility in the left side of the nose and the left upper lip, from the division of the second branch of the fifth pair of nerves.

Description of the Tumor.—The tumor, after its removal, exhibited the following appearance. At its summit appeared the lower floor of the orbit of the eye, at the inside of which was a portion of the nasal process of the os maxillary superius. On

its outer part projected one-half of the os malæ; below appeared the left half of the palate, with the exception of the part which belongs to the palatine plate of the os palati. A portion of the fossa canina, and the whole alveolar margin, with the correspondent teeth, were visible. On the inner wall of the mass appeared three considerable red-coloured lobes, attached to the outer and inferior part of the maxillary cavity, by something like a pedicle, about an inch in diameter—the three lobes being connected at their attachment, but separated at their internal or nasal extremity into an anterior, middle, and posterior lobe. The superior maxillary nerve was seen in and behind the orbit. The whole was covered by membranes which separated it from the parts in contact. One lobe had made its way through the bone of the face; the others through the partition between the nostril and antrum.”

Having quoted the description of the operation and tumor, I shall notice but a few of the remarks that follow. “The texture of the tumor,” says Dr. Warren, “was in consistence somewhat spongy and elastic, and was very vascular.” Again he observes: “In order to judge of the propriety of operating in such cases, we must distinguish from each other the different tumors which begin in the maxillary cavity and extend into the nostril, and raise the bony parietes of the face, orbit, and palate. I have seen four different species of such tumor. First, the osteo-sarcoma, of the upper maxillary bone; second, the fibrous tumor; third, scirrhus; and fourth, cephaloma.”

“The first, osteo-sarcoma, is the most formidable in appearance, and attains the greatest size. Its growth is rapid and luxuriant; it breaks down the surrounding bones, and produces enormous deformity. This affection, terrible as it is in appearance, is tractable by operation, and its careful removal is generally followed by a successful result. The second, fibrous tumor, is of slower growth, and more limited in its ravages. This may be removed with a reasonable certainty of its not returning. Third, scirrhus. This form of tumor of the antrum is characterized by its hardness, the pains which attend it, its moderate growth and certain fatality. Fourth, the cephalomatous is rapid in its growth, and of a spongy texture, produces excessive bleedings, and terminates by death, unless removed at an early stage.”

It was for the removal of this fourth species of tumor that Dr. Warren operated, and although more than a year has elapsed, there are no indications, so far as I have been able to learn, of a return of the disease.

In remarking upon the causes of malignant tumors, Dr. W. argues that those who hold that such morbid production, "are necessarily and early the result of a contaminated circulating fluid," "must of course believe that every operation for their removal," "is utterly unavailing," and, while he admits "that a great number" "are followed by signs of a general vitiation of the blood," he believes that inasmuch as they are not always reproduced after their extirpation, that they often attack persons who are unaffected with any general or constitutional vice whatever.

I fully concur in the opinion, that, if all malignant tumors resulted from a vitiation of the circulating fluid, independently of all other causes, no operation for their removal would be successful, but I cannot admit, that inasmuch as they are sometimes successful, it follows, that individuals unaffected with any constitutional taint or vice, may, and not unfrequently do, become the subjects of them. I do not think that this conclusion is warranted, but having already endeavoured to show, that local causes alone, are incapable of producing them, and that they were dependent, both upon these, and some constitutional vice or taint, it will not be necessary to repeat what has before been said upon the subject.

In conclusion, I would remark, that Professor Pattison proposed in 1820, for the dispersion of fungous tumors of the maxillary sinus, the tying of the carotid artery. He was induced to recommend this method of treatment, from the consideration, that the "capability of action of a part, is proportioned to its vascularity." and that thus by cutting off the circulation of blood to it, the morbid growth would slough and be thrown off. He says this practice has been successful where it has been adopted, in all the cases that have come to his knowledge.*

* Vide, Appendix of Surgical Anatomy of the Head and Neck, pages 477-8.

CHAPTER EIGHTH.

EXOSTOSES OF ITS OSSEOUS PARIETES.

THE osseous walls of the maxillary sinus sometimes become the seat of bony tumors—a disease designated by medical writers by the name of exostosis. This, however, is not an affection peculiar to the bony parietes of this cavity; all of the osseous structures of the body are liable to be attacked by it.

Exostoses, like many other diseases, presents several varieties. It is divided by some writers into true and false, the one consisting of a tumor composed wholly of bone, or nearly so, and the other, of a tumor composed both of ossific matter and fungous flesh, or of a mere thickening of the periosteal tissue.* Sir Astley Cooper divides exostoses into periosteal, medullary, cartilaginous and fungous. The first consists of a deposition of bony matter on “the external surface of a bone and the internal surface of its periosteum,” and to both of which it firmly adheres. The second consists of “a similar formation, originating in the medullary membrane and cancellated structure of the bone;” this description of exostosis never attacks the walls of the maxillary sinus. By cartilaginous exostoses he means “that which is preceded by the formation of cartilage, which forms the nidus for the ossific deposit.” Fungous exostoses he describes to be a tumor not so firm in its consistence as cartilage, but harder than fungous flesh, having interspersed through its substance spicula of bone, of a malignant character, and dependent upon some peculiar constitutional diathesis, and action of vessels. This species of exostosis differs but little, if at all, from osteo-sarcoma.

Exostoses differ as much in shape as they do in structure.

* Vide, Dictionnaire des Sciences Medicales, t. xiv. p. 218.

They sometimes rise abruptly from the surface of bones by a narrow and circumscribed base, projecting in large irregularly or spherically shaped masses; at other times they rise very gradually, covering a larger surface of the affected bone, but less massy and with limits less perfectly defined. An exostosis has been known to occupy the whole extent of the surface of a bone. "The whole external surface of one of the bones of the skull was found occupied by an exostosis while the cerebral surface of the same bone was in a natural state."* Both sides and the whole thickness of bones are occasionally affected by this disease. This is what Sir Astley Cooper calls periosteal exostosis.

This disease is said to attack some bones more frequently than others. Those of the skull, the lower jaw, sternum, humerus, radius ulna, femur, tibia and bones of the carpus are said to be the most subject to it. It also, very frequently attacks the upper jaw, and none of the bones of the body, in fact, are exempt from it.

The texture of exostoses is sometimes spongy and cellular, at other times very dense. Dr. E. Carmichael, a distinguished surgeon and physician, formerly of Fredericksburg, but now of Richmond, Va., described to me, about seven years since, an exostosis of the superior maxillary, which had, a short time before, fallen under his observation, larger than a hen's egg, and as solid as ivory. Exostoses of the roots of the teeth are always hard, exceeding in density, very frequently, even tooth-bone; and instances are sometimes met with of osseous tumors upon other bones possessed of nearly an equal degree of solidity. Exostoses of this description grow less rapidly than those which are more cellular; but they sometimes acquire a very large size. It is not, however, uncommon for such, after having attained a greater or less size, to cease to grow, and "remain stationary" through life, without giving rise to any very serious or unpleasant consequences.

Exostoses sometimes attain an enormous size, and especially

* Vide, last American edition of Cooper's Surgical Dictionary, p. 362.

upon cylindrical bones; very large ones too, are frequently met with upon the maxillæ. The largest one I believe, of the maxillary sinus, of which medical history furnishes any account, is exhibited upon a specimen of morbid anatomy, presented in 1767, by M. Beaupreau, to the French Academy. A description and drawing of this tumor is contained in the Memoirs of the Royal Academy of Surgery, but we have no account of the history of its formation, nor of the symptoms that resulted from it. The tumor occupies the whole of the right maxillary sinus, and several of the neighbouring bones are involved in it. It is very large near its base and projects from the lower part of the orbit, forward and downward, six inches. Its largest circumference, is said to be one foot. The upper part of the maxillary bone, says Bordenave, projects on the side of the orbit, and straightens the cavity; the *os unguis* is included in the mass of the tumor, and is represented as being nearly effaced. The nasal bones of the left side are displaced, and the right nostril entirely closed up, and the exostosis projects so much on the left side as to be nearly underneath the malar bone. The inferior part of the maxillary bone, says our author, is so extended near its base, that it inclines obliquely to the left, and the pterygoid apophyses of this side are larger than those of the other. The malar bone is described as being involved in the upper and external part of the exostosis, which extends to the left maxillary bone.

Exteriorly, says Bordenave, the tumor had a smooth and polished appearance, its upper part was very hard, inferiorly its substance had become thinner, was wanting in some places, and the interior of the exostosis was exposed. The substance of the bone was spongy and serous, and in appearance, not unlike pumice stone. The walls were thick, and measured in some places one inch.*

From this brief description, taken from the one given of it by Bordenave, some idea may be formed of the dimensions and appearance of this enormous and most remarkable exostosis.

A case of exostosis of each antrum, is described by Sir Astley

* Vide, Memoires de l'Academie Royale de Chirurgie, t. xiii. obs. xii. p. 412.

Cooper, both of which forced themselves up into the orbits, and pushed the eyes from their sockets. One made its way into the brain, and caused the death of the patient.*

Mr. Thomas Bell does not believe in the occurrence of "true exostosis upon the bony parietes" of this cavity, but too many examples have presented themselves, to leave any room for doubt upon the subject. Although none may ever have fallen under his own immediate observation, there are many well authenticated cases on record,—the details of some of which, I shall presently give. Apart from these, I think it would be difficult to assign any sound reasons for supposing that the osseous walls of this cavity should be more exempt from the disease than the other bones of the body.

SYMPTOMS.

The attacks of exostoses of the walls of the maxillary sinus, are generally so insidious, that the presence of the disease, is not, for a long time, even suspected. Those which result from venereal vice, Boyer says, are preceded by acute pain, extending at first to almost every part of the affected bone, but which afterwards confines itself to the affected portion. Those which are occasioned by serofula, the same writer tells us, are attended by a duller and less severe pain, the symptoms of those resulting from causes purely local, such, for example, as a blow, are very similar.† These signs are common to the disease wherever it may be situated, and when it is seated in the maxillary sinus, they do not distinguish it from many of the other affections that occur here; for they are often produced by them, as well as by exostoses. Furthermore, the disease, not unfrequently gives rise to other symptoms which are attendant upon several of the other affections of this cavity, so that previously to the distension of its walls, it may be confounded with inflammation of the lining membrane, or sarcomatous or other tumors. After it has filled the sinus, or very considerably thickened its exterior walls, it will cause them to offer a firmer resistance to pressure, than will any

* Surgical Essays, part i. p. 157.

† Traite des Maladies Chirurgicales, t. iii. p. 545.

of the other diseases of this cavity. When, therefore, they have become distended, if they are firm and unyielding to pressure, the presence of exostosis may be inferred.

CAUSES.

There is a difference of opinion among writers on the diseases of the bones, with regard to the causes of exostoses. Certain constitutional diseases, such as "scrofula and lues venerea," are thought by some to give rise to the affection. That the last of these diseases is favourable to its production, is, I believe, admitted by all; but Sir Astley Cooper declares that no evidence has yet been adduced to prove that the former is ever concerned in its production. Others impute the disease to local irritation produced by contusions, fractures, &c. &c. It is probably dependent upon both local and constitutional causes, and that neither, independently of the other, is capable of producing it.

TREATMENT.

A variety of plans of treatment have been recommended for this disease, and Bordenave assures us it may be cured, if suitable remedies are applied before it has acquired much solidity. Assuming that it sometimes results from constitutional causes, he directs that the treatment should be commenced by the employment of such means as are indicated by the nature of the vice with which the patient may be affected. If a venereal vice be present, the use of mercurial medicines are recommended. The author last mentioned, says he has known it to be successfully treated with mercury. Topical applications, such as fomentations and cataplasms, have also been found serviceable. Boyer advises poultices of linseed meal, and a decoction of the "leaves of henbane and nightshade." Iodine and mercury have been employed, but not, I believe, with any decided advantage. Sir Astley Cooper thinks the best internal remedy is "oxymuriate of quicksilver, together with the compound decoction of sarsaparilla." I believe, with Boyer, that a dispersion of an exostosis can never be effected. Its progress may perhaps be partially arrested, but

I do not believe, as many do, that it is ever removed by the absorbents. It is not advisable to remove exostoses unless they continue to augment and are likely to become dangerous, or are productive of serious inconvenience.

When, therefore, the remedies which have been mentioned, after having been thoroughly tried, prove unsuccessful, the tumor should be fully exposed; first, by the dissection of the gum and other soft parts from the exterior wall of the sinus, and secondly, by the perforation of this cavity with a trephine, or such other instrument as can be most conveniently employed. This part of the operation, though simple, should be conducted with care. If the tumor be large and attached by a very broad base, its removal will sometimes prove more difficult, yet by means of suitably constructed saws, scissors, knives, &c., it may, in most instances, be easily effected. An external wound through the cheek should always, if possible, be avoided.

The method of operating, however, will be best understood by a description of that pursued in the two following cases. The first was treated by Dr. B. A. Rodrigues, dentist, of Charleston, S. C., and reported by him for the "American Journal of Medical Sciences."

CASE 26th. "On the 14th of August, 1837, Charity, a servant woman of Mrs. Miller, called on me to ascertain whether I could afford her any relief in her wretched condition. She had been labouring under incessant and agonizing pain in the antrum highmorianum of the right side, which she regarded as the consequence of the impaired condition of the teeth. On this supposition, she had several of them extracted, without any appreciable abatement of her sufferings. Yet deluded with the belief that some one of the remaining teeth was the secret agent of all she suffered, she persisted in having more extracted. Still the evil continued, the suffering was unabated, the cause undetected; and to add to the depression of her hopes, and the aggravation of her ills, a purulent discharge oozed from the empty sockets of the affected side. She again had recourse to medical advice, hoping that this phase of her malady might lead to some indication that would relieve her; at

least, that it might reveal its hidden sources, its condition, and its prospects of being remediable. And here for the first time, was it suggested that the antrum was in an unsound state.

It was at this moment, under these circumstances, that she applied to me to perform an operation, which her medical adviser declared to be indispensable. At first, I imagined it to be an abscess from the cavity from which the pus was discharged, from the strange sensations experienced, and from the greater frequency of this disease over others peculiar to this part, I inserted a trocar into the socket of the second molar, and, instead of the gush of matter I had expected, the passage of the instrument was intercepted by a hard dense impregnable substance. The existence of an exostosis now forced itself on me. To make assurance doubly sure, I had access to several of my medical friends, among whom, was Dr. Geddings. On examination of the part, the consideration of the symptoms, the obstinate nature of the disease, they concurred with me in opinion, that an exostosis was present, and that the sole indication of relief was its extirpation. Accordingly, on the 18th of August, the above gentlemen with several others of the profession were present, when I proceeded to perform the operation. With a common scalpel, I dissected away the gum from the canine tooth to the last molar, raised the flap which it made from the alveolar process, and with a trephine opened into the cavity. Success was easier than had been anticipated in consequence of the carious condition of the process, which was so general on the affected side, as to reach from the second incisor anteriorly to the pterygoid process posteriorly. In the loss of substance, the external parietes of the cavity shared, so that the bony tumor which filled up and occupied it, could be readily reached. The trephine was applied, the cavity enlarged, and the exostosis removed. It measured in circumference three inches, was light, and cancellated on its surface, but dense and more resisting in its more internal layers. There was little or no hemorrhage to delay the operation, or any application to arrest it. After removing every spiculum of diseased bone, and cleansing out the cavity, the flap was replaced and to nature was entrusted the cure. Granulations sprouted up in full luxuriance,

and in the short period of four weeks, the woman was in the enjoyment of excellent health.*

That the foregoing was a case of true exostosis of the maxillary sinus does not admit of doubt, and it is to be regretted, that more of the early history of the disease and the circumstances connected with its development are not known. They might perhaps lead to a correct explanation of the causes that gave rise to it. The presence of local irritants in the immediate vicinity of this cavity, is proven by the fact that the patient's teeth were in a diseased condition, but to what extent they may have contributed to the production of the exostosis, it is impossible to determine, since we are not furnished with any information concerning the state of her general health. She may have been affected with some constitutional vice, or peculiar habit of body, whereby the osseous structures of the system were predisposed to affections of this description, requiring only the presence of some local irritant to induce the morbid action necessary to their development. That such predisposition did exist, and that such action was excited by the irritation produced by the diseased teeth, I believe would appear, if all the circumstances connected with the previous history of the case could be ascertained.

When the connection of the exostosis is such as to prevent its complete removal, the application of the actual cautery to any remaining portions, will prove serviceable, by causing such parts to be exfoliated. The history of a case is related by M. Bordeneuve; treated by M. Runge, in which a portion of the exostosis was left, and which ultimately caused the death of the patient. This would probably have been prevented had an exfoliation of the remaining diseased portions of bone been brought about by an application of the actual cautery.

CASE 27th.† The subject of this case was a man 33 years of age. He had been for a long time afflicted with a tumor in the region of the right antrum. It depressed the palatine process of the maxillary bone and the palate bone of the affected side in

* American Journal of Medical Sciences.

† Vide, *Memoires de l'Academie Royale de Chirurgie*, t. xiii. obs. xi. p. 408.

such a manner as to restrict the movements of the tongue, while on the other side it pressed against the floor of the orbit so as to cause a protrusion of the eye. Anteriorly, it had elevated a portion of the maxillary and malar bones which covered it, and extended to the most dependant part of the nose, whilst posteriorly it extended as far as the posterior mouth. Its effects upon the lateral parts were nearly the same as those which it had exerted upon the others.

After having exposed the anterior parietes of the antrum, M. David sawed from below upwards to the uppermost part of the projection of the tumor, which was of a spherical shape, and nearly three inches in diameter, and after having elevated that part, he discovered the tumor, which was white and hard; although spongy, and bearing a strong resemblance to soft agaric, it occupied the maxillary sinus. It had changed the form of this cavity and increased its dimensions to an extraordinary degree. The greater portion of this hard osseous substance, although firmly adhering to almost every part of its bony envelope, was, by a persevering employment of various means, such as the crotchet, elevator, surgeon's rasp, &c. &c., detached by M. David. In doing this, he inflicted some injury upon the floor of the orbit, and to some portions which still adhered to the palatine process of the maxillary bone, he applied the actual cautery, which was repeated several times.

An opening was formed by this operation four and a half inches deep, and from right to left, of more than three inches, but a cure was notwithstanding speedily effected by it, which, had the use of the cautery been omitted, would not perhaps have been successful.

Exostoses of the maxillary sinus often give rise to other morbid conditions of this cavity, the remedial indications of which, should be properly attended to, as should also those of any constitutional affection, vice, or habit of body that the patient may be labouring under at the time.

When the exostosis is not complicated with any other disease of the cavity, the restorative energies of nature, after its removal, will generally be all that is required to complete the cure.

CHAPTER NINTH.

WOUNDS OF ITS OSSEOUS PARIETES.

THE walls of the maxillary sinus are sometimes fractured by blows and pierced by sharp-pointed instruments. Fouchard mentions a case, in which a canine tooth had been driven up into it.* This is an accident that rarely happens. The instance here alluded to, is, I believe, the only one on record; and as might be supposed, it was followed by severe pain, and it ultimately gave rise to a tumor upon the cheek near the nose, and three fistulous openings, from which a fetid matter was discharged. The sinus having been opened, and the tooth taken from it, a cure was at once effected.

It often happens when the walls of the sinus are fractured from a blow or other mechanical violence, that portions of the bone and foreign bodies are driven into the cavity, and which, remaining there, become a constant source of irritation to its lining membrane, and, not unfrequently, a hidden cause of other and more malignant forms of disease. Bordenave describes the case of a French officer, who had the walls of one of his maxillary sinuses fractured by a fragment of a bomb. Dressings were applied to the wound, but it did not heal, and upon examination sometime after by M. Allouel, several pieces of bone and a splint which nearly filled the cavity were found. These were removed, but a cure was not immediately effected; a fistulous opening still remained, and it was not until a long time after, when another splinter came away, that the external opening healed. The same writer mentions the case of a man who had a nail forced head

* *Le Chirurgien Dentiste*, tom. i. page 391.

foremost by the discharge of a gun, into his right cheek and maxillary sinus. The opening became fistulous, and although the point of the nail was subsequently discharged, it was not until M. Faubert had removed the remaining part, that the fistula closed.

Wounds of the antrum are almost always complicated with fractures of its osseous parietes, so that the effects resulting from them are more to be dreaded than those which would be produced simply by the penetration of it with a sharp instrument.

TREATMENT.

The nature and extent of the injury inflicted, should determine the treatment most proper to be adopted for wounds of this cavity. Complicated, as they in most instances are, with the presence of extraneous substances in the sinus, the removal of these constitutes the first, and not unfrequently, the only remedial indication. This should never be neglected. When any extraneous bodies, or portions of bone, have been forced into the sinus, these should first be all carefully removed. The external wound should next be dressed with adhesive slips so as to prevent the formation of an unsightly cicatrix. If constitutional symptoms supervene, they should be met with appropriate remedies.

The following interesting case of a wound of the maxillary sinus, inflicted with a dirk-knife, reported by R. S. Welden, student of medicine, and treated by W. H. Donne, M. D., of Louisville, Ky., is taken from the *Western Journal of Medicine and Surgery*.

CASE 28th. "Schuti, a gardener, aged 42 years, a native of Germany, in a rencontre with an athletic man, on the 3d of May, 1840, was struck with a dirk-knife, which entered about an inch above the right superciliary arch, passed through the corresponding cyclid downwards and backwards, evacuating the humors of the eye, and penetrated the antrum. The globe of the eye was divided by a vertical incision, through which the aqueous humor

escaped; the iris was extensively detached at the ciliary margin, and could be partially seen through the transparent cornea—its surface being somewhat obscured by small coagula. The hemorrhage was slight and easily controlled by moderate pressure. The patient complained of intense pain in the temple and cheek of the wounded side, shooting deep into the orbit. Three points of interrupted suture were used to approximate the edges of the divided eye. Lint, saturated with laudanum and warm water, constituted the dressing.

May 4th. Some tumefaction in the eyelid; pulse 110; tongue coated and dry; skin hot; patient has spent a very restless night. Ordered following medicine, tart. emetic, gr. i.; sulph. magnesia, $\frac{3}{4}$ ss.; to be dissolved in one-half pint of water, and a table-spoonful to be taken every half-hour, until nausea is induced—after which the interval may be increased.

May 5th. Bowels freely evacuated; pain less; skin moist; pulse 90 and soft. From this period until the wound healed—the space of three weeks—no constitutional symptoms of an untoward character occurred. The patient, however, contended that a portion of the knife-blade remained in the roof of his mouth. But on the most careful examination no foreign body could be detected.

On the 10th of August, 1842, Mr. Schuti called and requested Dr. Donne to examine his mouth, stating that for six months past he had been annoyed by a rough, projecting substance, which some person had informed him was a piece of dead bone, but which he believed to be the point of the knife, that had been driven down into the bone by the violence of the blow. On looking into the mouth, a small black speck was discernible about one-half inch from the interval between the first and second molar teeth. The parts adjacent were somewhat tumefied and inflamed. Dr. Donne made several attempts to extract this body with a pair of common dissecting forceps, but found it immovably fixed in the substance of the bone. By dissecting around it with a bistoury, down to the palate process of the superior maxillary bone, he was enabled to get a firmer hold, and, with a pair of curved tooth-forceps, succeeded in removing a fragment of the blade, one and one-fourth inches in length, and three-fourths in width at the widest

part; the extraction was not effected without considerable violence, and was attended with extreme suffering. The fragment came out with an audible snap, which induced those present to suppose, at first, that it had been broken; but on inspecting its surfaces closely, they were found similarly oxydized, and wanting the lustre which a recent fracture had presented. Upon probing the aperture through which the fragment had been extracted, no other piece could be detected. This opening would scarcely admit the curved probe which Dr. Donne passed into the antrum, in order to satisfy himself that the whole of the foreign body was removed. The next day there was a slight discharge from the aperture, though the patient has suffered very little pain since the operation."

The foregoing is certainly one of the most singular cases of which we have any account, and the most remarkable circumstance connected with it is, that no more injury should have resulted from the presence, for so long a time, in the maxillary sinus, of the portion of the blade of the knife that had been broken off. In the cases previously noticed, as reported by Bordenave, disease of the mucus membrane of the antrum, and the discharge of a fetid sanies resulted from the presence of the foreign bodies in this cavity. The same effects were also produced in the case described by Fouchard, of the canine tooth which had been forced up into it.

CHAPTER TENTH.

FOREIGN BODIES IN IT.

THAT foreign bodies are sometimes admitted into the maxillary sinus through wounds penetrating its exterior parietes, has already been shown, but that they should gain access to it in any other way, would seem almost impossible. The smallness and peculiar situation of the opening which communicates with it, is such, as one would think would preclude the introduction of extraneous substances of any kind through it, yet they have been found here when they could not have gained admission in any other way. There are several well authenticated cases on record in which worms have been found in this cavity. The case mentioned by Bordenave in *Obs.* 12, page 380, vol. 13 of the *Memoirs of the Royal Academy*, of a diseased maxillary sinus, from which several worms were at different times discharged, does not prove that they obtained admission into it through the nasal opening, and thus, as some writers have conjectured, gave rise to the disease with which it was affected. In this case, a fistulous opening from the cavity, had existed for a long time previously to the discharge of the worms from it, and it is very probable that they introduced themselves through this. A cause sufficient to have produced the disease in the sinus, had been operating for two years, immediately preceding its manifestation. The patient during the whole of this time was affected with pain in the superior teeth of the affected side.

Deschamps says, his colleague of la Charité Hospital, found a worm, in the maxillary sinus of a soldier, whom he was dissecting, four inches long; and the same writer informs us that a similar example is furnished in the *Journal of Medicine*. The par-

ticulars of a case which came under the observation of Mr. Heysham, physician, of Carlisle, taken from a work entitled "Medical Commentaries," are contained in Cooper's Surgical Dictionary.* The subject of this case was a strong woman, sixty years of age, who was in the habit of taking a great deal of snuff. She was affected for a number of years with severe pain in the region of the maxillary sinus, which "extended over one side of the head." She was never entirely free from this pain, but it was greater in cold than in warm weather, and for the purpose of obtaining relief she had been twice salivated, and had taken various anodyne medicines. The pain, however, instead of being mitigated by these means, became more severe. Her teeth on the affected side were all extracted, and as a last resort the maxillary sinus was perforated. This, for several days did not give any relief. Injections of bark and "elixir of aloes," were thrown into it, and "on the fifth day a dead insect" of more than an inch in length, and as thick as a "common quill," was removed from this cavity.

Instances of the introduction of insects or foreign bodies of any description, into the antrum through the nasal opening, fortunately, are so exceedingly rare, that the Memoirs of Medicine do not furnish more than four or five well established examples.

SYMPTOMS.

The signs indicative of the presence of insects or foreign bodies in the maxillary sinus, are so obscure, that the fact can only be ascertained by perforating the cavity and on an examination of its interior. Some say that foreign bodies here cause an itching, crawling or tickling sensation in the substance of the cheek. This is an uncertain diagnosis, for such sensations are not unfrequent in the region of this cavity. That they sometimes cause great pain, is proven by the history of the case related by Mr. Heysham, the particulars of which I have just noticed. This, like the other signs, is not peculiar to occurrences of this sort alone. It is more or less common to all the morbid affections of this cavity.

* Vide, Art. Antrum, page 155.

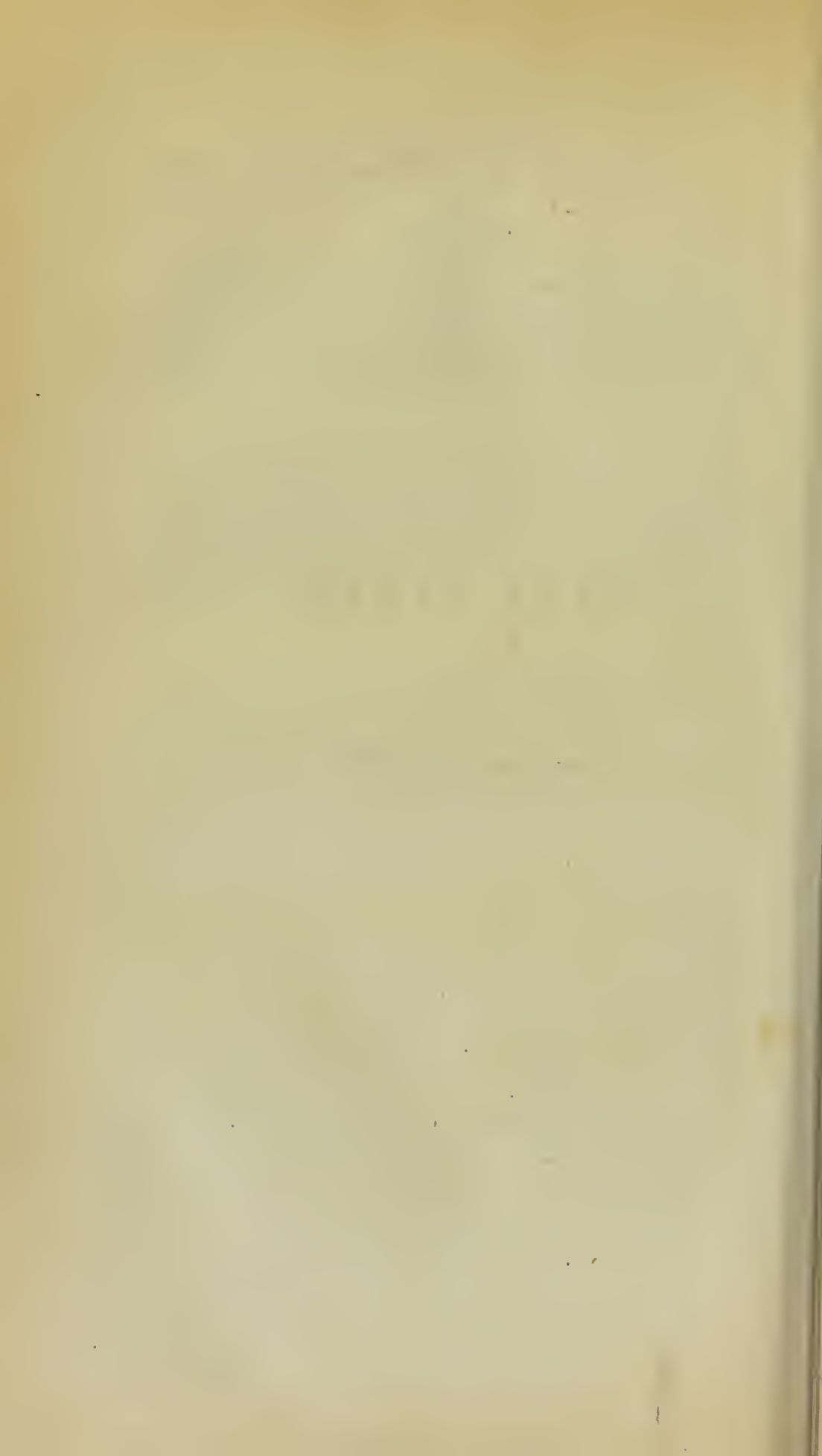
TREATMENT.

The proper remedial indication for foreign bodies in the antrum, is their removal. When insects are discovered here, injections of oil and tepid water are recommended. This constitutes all the treatment necessary to be employed in cases of this kind.

PART SIXTH.



MECHANICAL DENTISTRY.



PART SIXTH.

MECHANICAL DENTISTRY.

BY MECHANICAL DENTISTRY is meant the art of constructing and applying *artificial teeth, artificial palates, and appliances for the correction of irregularity in the arrangement of the natural teeth.* But in treating upon this part of my subject, I shall confine myself to the first, or a description of the various methods of constructing and applying artificial teeth,—and in doing this, it is not my intention to include that of the manner of manufacturing the porcelain teeth, inasmuch as this has become a separate and distinct business, and constitutes no part of the duties of the dental surgeon. In fact, to produce the best quality of porcelain or mineral teeth, it is necessary that those who engage in their manufacture, should devote their whole time and undivided attention to it.

Before entering upon a description of the method of procedure in the construction of artificial substitutes for the natural teeth, and the manipulations connected therewith, I shall offer a few general remarks on the subject of such substitutes—the substances of which they are composed—the means employed for their retention in the mouth, and the surgical treatment required preparatory to their application.

CHAPTER FIRST.

ARTIFICIAL TEETH.

CONTRIBUTING as the teeth do, to the beauty and pleasing expression of the countenance—to correct enunciation—and by the function of mastication which they assist in performing, to the health of the whole organism, it is not surprising that their loss should be considered a serious affliction, and that art should be invoked to replace such loss with artificial substitutes. So great indeed is the liability of the human teeth to decay, and so much neglected are the means of their preservation, that few persons reach even adult age, without losing one or more of these invaluable organs. But happily for suffering humanity, they can now be replaced with artificial ones so closely resembling those planted in the jaws by the hand of nature, as to be readily mistaken for such, even by the most critical and practiced observers. Although there is a perfection in the works of nature that can never be equalled by art, the latter can nevertheless be so constructed and applied, as to subserve, in the majority of cases, though not with the same convenience nor as perfectly, the purposes of the former.

As great as have been the achievements in the other departments of dental surgery, during the last ten or fifteen years, they have been fully equalled, if not surpassed, by those in the one on which I am at present treating. Mechanical dentistry has now arrived nearer to perfection, than its most sanguine and zealous cultivators dared, fifteen years ago, in the most ardent flights of their imagination, anticipate it could ever be brought. And, judging from the past, the *ne plus ultra* of achievement in it, has not even yet been attained.

The insertion of artificial teeth, is an operation, which, though acknowledged to be of great importance, and performed by every one having any pretensions to a knowledge of dentistry, is unfortunately, but little understood by the majority of practitioners. By its improper performance, the mouth may be irreparably injured. A single artificial tooth badly inserted, may cause the destruction of the two adjacent natural teeth, and, if the deficiency thus occasioned be unskilfully supplied, it may cause the loss of two more, and in this way a whole set of teeth may be, and often is, destroyed.

The utility of artificial teeth depends upon their being properly constructed and correctly applied. An enlightened judgment and great practical skill, therefore, are required by those who practice in this, as well as in the other departments of the art. A knowledge of the anatomy and physiology of the mouth—its various pathological conditions and therapeutical indications, is essentially necessary to the dental practitioner; and as important as is correct information to him upon these points, it is even more so, that he should be thoroughly skilled in the various mechanical manipulations that pertain to the prosthesis of these organs. As great mechanical nicety and as perfect accuracy of execution are required in the construction of an artificial substitute for the natural teeth, as in the manufacture of the various parts of a watch or any other complicated piece of mechanism. In fact, more ingenuity and tact are required in the former than in the latter, for there are no two cases requiring artificial teeth precisely alike, consequently the artist must be governed by circumstances that are peculiar to each, and that differ from those of any other; whereas, in making a watch, he only copies what he has made perhaps a thousand times before.

There are difficulties connected with the insertion of artificial teeth which none but an experienced practitioner has any idea of. Besides those of properly constructing and applying them in such a manner, as that they may be easily removed and replaced by the patient, and at the same time, be securely fixed in the mouth, and productive of no injury to the parts with which they are connected or associated, there are sometimes others equally difficult to overcome. For example; the loss of a tooth

in one jaw, is generally followed by the gradual protrusion from its socket, of the one with which it antagonized in the other, so that if that be replaced with an artificial one of equal size, it will strike against this at each occlusion of the mouth, and prevent the other teeth from coming together. This tendency of the teeth in one jaw to protrude, is always in proportion to the number lost in the other; and if not soon counteracted by the replacement of the latter with artificial substitutes, often gives rise to an obstacle to their proper application, which will require no little ingenuity and tact to overcome. If it were necessary, I could mention other difficulties connected with this branch of practice, equally great, but shall let it suffice to state, that there are few, as formidable as they oftentimes are, which the well-informed and skilful dentist cannot successfully overcome.

But, notwithstanding the triumphs of Mechanical Dentistry—the high state of excellence to which it has arrived, there never was a time, when so much injury was inflicted, and suffering occasioned by artificial teeth, as at present, and resulting too, from their bad construction and incorrect application. That such should be the case, when there are so many scientific, skilful practitioners in every city, and in many of the towns in the country, may seem strange, but the fact is nevertheless undeniable, and will continue to be so, as long as the public are willing to receive a newspaper advertisement of *cheap dentistry*, as sufficient evidence of competency on the part of those who practice the art.

Many have chosen dentistry as a profession, under the belief that a knowledge of it could be more easily acquired, than that of any other honourable and profitable calling, and some, after having followed it for two or three years, finding, that to obtain respectability and usefulness, greater difficulties were to be surmounted than they had anticipated, have abandoned the pursuit, rather than bring disgrace both upon it and themselves. Let no one, therefore, be deceived into the belief, that he can become master of the art, in a few weeks or months, for, should he commence the study under such an impression, he will be disappointed, and find, after having devoted to it what he had been led

to suppose, sufficient time for its thorough acquisition, that he has then scarcely attained a knowledge of its elementary principles.

The information obtainable from works on mechanical dentistry, was, until recently, exceedingly limited; and it is surprising, that, from the number who have written on the surgery of the teeth, this subject should have received so little attention. Fouchard, Bourdet, Angermann, Maury, Delabarre, Koecker, Lefoulon, Brown and a few others, are all who have given it any thing more than a passing notice; and the works of but few of these writers, contain any thing like explicit directions upon the subject. Delabarre's *Mechanical Dentistry* was, in its time, a work of much merit. The various methods adopted at the period of its publication, for the construction and application of artificial teeth, are accurately and minutely described in it,—together with the advantages and disadvantages of each. But however perfect the work may then have been, it does not furnish the information required upon the subject at the present day. And still more deficient in correct information are all the other French works.

Among the English writers, Koecker is almost the only one, who has described correctly the principles upon which artificial teeth should be applied. His "Essay on Artificial Teeth, Obturators, and Palates," contains much useful and valuable information. It does not, however, contain a description of the various manipulations through which a dental substitute should pass, preparatory to its application; yet to one having a knowledge of them, it is very serviceable. As the ability to properly execute a piece of dental mechanism, can only be acquired by a regular apprenticeship, Dr. K. perhaps thought that a more minute description than what he has given, was unnecessary; but there are many practitioners, who are, in other respects competent, that have not enjoyed this advantage, or at least, not in the mechanical department, and consequently it is to be regretted, that he has not entered more into detail.

But any deficiency that may exist in the last named work, is fully made up by that accomplished writer and excellent practitioner, Dr. Solyman Brown, in his series of papers on *Mechanical Dentistry*, published in the *American Journal of Dental Science*. These papers are illustrated with numerous cuts, and constitute

the very best treatise upon the subject that has ever been published. The various manipulations connected with this branch of the art, are here fully and accurately described.

OF THE SUBSTANCES EMPLOYED FOR ARTIFICIAL TEETH.

There are certain qualities, which it is highly important that artificial teeth should possess. They should be durable in their nature, and in their appearance resemble the natural organs, with which they have oftentimes to be associated.

The kinds of teeth employed, are

1. Human teeth.
2. Teeth of neat cattle, sheep, &c.
3. Those carved from the ivory of the elephant's tusk, and the tooth of the hippopotamus.
4. Porcelain teeth.

HUMAN TEETH.

As far as it regards appearance, and in a dental substitute this is an important consideration, human teeth are preferable to any other, and when used for this purpose, they should be of the same class as those whose place they are designed to supply. The crowns only are employed, and if well selected, and properly inserted, the artificial connection with the alveolar ridge cannot easily be detected.

The durability of these teeth when thus employed, depends on the density of their structure, the soundness of their enamel, and the healthy condition of the mouth in which they are placed. If they are of a close texture, and have a sound and perfect enamel, and are inserted in a healthy mouth, they will last from eight to twelve or a greater number of years. The difficulty, however, of procuring these teeth, is generally so great, that it is seldom that such as I have just described, can be obtained, and even if they could be, the mouth in four cases out of every five, in which artificial teeth are placed, is not in a healthy condition, its secretions are vitiated and of so corrosive a nature, that they often destroy them in less than four years. I have even known

them to be destroyed by decay in two, and in one case in fifteen months.

A human tooth, fixed in the mouth by art, is more liable to decay than one of equal density having a vital connection with the general system, for the reason, that its osseous structure is more exposed to the action of deleterious chemical agents. But of all the animal substances employed for this purpose, human teeth are unquestionably the best. They are harder than other bone, more perfectly protected by enamel, and consequently more capable of resisting the action of the corrosive agents to which all artificial as well as the natural teeth, are exposed.

Many object to having these teeth placed in their mouths, under the belief that infectious diseases may be communicated by them. But there is no good foundation for such fear, for the purifying process to which they are previously submitted, precludes the possibility of the communication of disease through their agency. When the practice of transplanting teeth was in vogue, occurrences of this sort were not unfrequent, but since that has been discontinued, it has never happened. But, notwithstanding, the prejudices of some against having human teeth placed in their mouths, are so strong, that it is impossible to overcome them.

It would, however, be impossible to meet the demands for artificial teeth, if these were the only kind used. The difficulty of procuring them, and the high price they command, have induced many practitioners to profit by the popular prejudice against them, and to employ other substances in their stead.

TEETH OF CATTLE.

Of the various kinds of bone employed for dental substitutes, the teeth of neat cattle, are perhaps, after the human teeth, the best. By slightly altering their shape, they may be made to resemble very closely, the incisors of some persons, but a configuration similar to the cuspidati cannot be given to them; and in the majority of cases they are too white and glossy to match any of the human teeth. The contrast therefore, which they form with the natural organs should constitute, if they were in all re-

spects unobjectionable, an insuperable objection to their use. This has been too much disregarded, both by dentists and patients. Indeed, many of those who wish artificial, believe that they cannot get them too white or too brilliant.

There are other objections, than those which I have just mentioned, to the use of these teeth. In the first place, they are only covered anteriorly with enamel, and, in the second place, their bony structure is less dense than that of the human teeth, and consequently are more easily acted on by chemical agents. They are, therefore, less durable, seldom lasting more than from two to four years. Another objection to their use is, they can only be employed in very few cases, for their nerve cavities are so large, that by the time they are reduced to the size of the incisors, they become exposed, and by the time these fill up with ossific matter, their crowns are so much worn away that they are too short, except in cases where such teeth are required. It is seldom therefore, they can be used as substitutes for the natural teeth, except for the central incisors, and here, only in the fewest number of cases.

But, as ill-suited as these teeth are to supply the place of the natural organs, they are preferable to many that are constructed from other kinds of bone. They are generally procured from slaughter-houses, and from beeves from seven to nine years old.

The teeth of sheep are sometimes made to answer tolerably well for replacing the lateral incisors. They are harder than the teeth of neat cattle, and from the smallness of their size, require no filing, except to fit them to the roots upon which they are intended to be placed, and to give a proper shape to their cutting edges.

TEETH MADE FROM THE IVORY OF THE ELEPHANT'S TUSK AND THE TOOTH OF THE HIPPOPOTAMUS.

The employment of these substances for artificial teeth, has been sanctioned by usage from the earliest periods of the existence of this branch of the art; but we must not hence conclude that it has been approved by experience. On the contrary, of all the substances that have been used for this purpose, these are certainly the most objectionable.

The ivory of the elephant's tusk is decidedly more permeable

than that obtained from the tooth of the hippopotamus. So readily does it absorb the fluids of the mouth, that, in three or four hours after being placed there, it becomes completely penetrated with them. Consequently, it is not only liable to chemical changes, but also to become offensive, and when several teeth, formed from it, are worn, they affect the breath so much, that it is exceedingly disagreeable to come within its influence. Teeth, on account of its softness, are easily shaped from it, but not being covered with an enamel, they soon become dark, and give to the mouth a most filthy and disgusting appearance. Fortunately, however, this article is, at present, but rarely used for the purpose.

The ivory of the hippopotamus's tooth is much firmer in its texture than that obtained from the elephant's tusk; and, as it is covered with a hard, thick enamel, teeth may be cut from it which will, at first, very much resemble those given us by nature. There is, however, a peculiar *animation* about the natural teeth which those made from this substance do not possess. These, moreover, soon change their colour, assuming first a yellow and then a dingy or dark bluish hue. They are also, like those just mentioned, very liable to decay. I have in my possession a number of blocks of this sort, taken from the mouths of different individuals, some of which are nearly half destroyed.

But there is another objection to teeth made of this article, which, even were there no other, would be sufficient to condemn its use. It is, that they, like those formed from elephant's ivory, give to the air, returned from the lungs, an insufferably offensive odor, which cannot be corrected or prevented. They may be washed half a dozen times a day, and taken out and cleansed again at night, but it will still be grossly perceptible; and, although it may be much worse in some mouths than others, none who wear teeth formed from this substance are entirely free from it.

To one, whose attention has never been directed to the subject, it would be astonishing to observe the effects produced upon the breath, from wearing two or three of these teeth.

But objectionable as this substance is, for a dental substitute, it is still employed by a few practitioners, and twelve years ago it was used by one-half of the dentists in the country. Influenced, however, by the discovery of its tendency to vitiate the secretions

of the mouth, to impart a fetor to the breath, and other objections which have been mentioned, I never used it, except during the first two or three years of my practice, and I should not then have employed it, had I been aware of the pernicious consequences that result from it.

PORCELAIN TEETH.

The manufacture of porcelain teeth, did not for a long time promise to be of much advantage to dentistry. But by the ingenuity and indefatigable exertions of a few, they have, within the last few years, almost entirely superseded every other kind of artificial teeth.

The French, with whom the invention of these teeth originated, encouraged their manufacture by favourable notices; and the rewards offered by some of the learned, and scientific societies of Paris,* contributed much to bring it to perfection. They were still, however, deficient in so many particulars, that they received the approbation of very few of the profession, and that only in some special cases. It is principally to American dentists, that we are indebted for that, which the French so long laboured in vain to accomplish.

A want of resemblance to the other teeth, in colour, transparency, and animation, was the great objection, that was urged

* The Medical Society of Paris, regarding the manufacture of these teeth, as of great importance to the good of mankind, proposed the following questions in relation to it, and offered a medal to any one who would satisfactorily answer them.

1st Question—"Quels sont les motifs de préférence que la porcelaine mérite sur les différentes matières animales, pour la construction des dents?"

2d Question—"Quels sont les moyens les plus simples et les plus économiques à employer pour composer et colorer la pâte ainsi que l'émail, et pour les cuire?"

3d Question—"Le précipité pourpre de Cassius (oxide d'or précipité par le muriate d'étain) est-il préférable à toute autre substance pour colorer les gencives au besoin? Quelle est la manière de l'employer?"

4th Question—"Le platine jouit-il des propriétés physiques et chimiques qui le rendent plus apte que les autres métaux, à disposer les dents de manière à pouvoir être facilement réunies entre elles après la cuisson?"

5th Question—"Quels sont les moyens mécaniques, les plus avantageux pour monter les dents et les ajuster dans la bouche, sans nuire à la solidité des dents naturelles?"—*Traité de la Partie Mécanique de l'art du Chirurgien-Dentiste, par C. F. Delabarre, p. p. 111, 112.*

against the porcelain; and, had it not been obviated, it would have prevented their ever being extensively employed. Until recently, all that were manufactured had a dead opaque appearance, which rendered them easy of detection, when placed along side of the natural teeth, and gave to the mouth an inanimated and sickly aspect. But so great have been the improvements, in their manufacture, that few can now distinguish any difference between them and the natural organs. During the last ten years, I have used, almost exclusively, the teeth manufactured by Mr. Stockton, of Philadelphia, and, have no hesitation in recommending them, as unsurpassed by any I have ever used. The ingenuity and indefatigable exertions of Mr. S. in bringing the manufacture of these teeth to such perfection, entitle him to the warmest thanks of the profession, and of the whole public. The extensive manner in which he carries on the business, enables him to furnish, at all times, teeth of every variety of shade and size. I would also mention the name of Mr. Aleock, who also manufactures very beautiful teeth.

Very good teeth are manufactured too, by several other individuals in this country; but in order to excel in the manufacture, it is necessary, as I have before stated, to devote to it, one's whole attention. Of those who have engaged in their fabrication, not more than one in fifteen has succeeded; and many, after having spent much time and labour, have abandoned the attempt, and supplied themselves from others, with a far better article, and at a much less expense.

The porcelain teeth are now procured at so low a price, that no inducement on the score of economy is presented to the dentist to attempt their manufacture; and should any suppose, that he can make such as will better suit the peculiarities of certain cases, that occasionally present themselves, I fear he will meet with sad disappointment. As it is not therefore essential, that the practitioner of dentistry should understand the manner of making these teeth, I shall not attempt its description, but refer the reader to the treatise of Audibran, where he will find the various articles that enter into their composition enumerated, and the method of their fabrication minutely described.

The advantages which these teeth possess over every sort of

animal substance, are numerous. They can be more nicely fitted to the mouth, and worn with greater convenience. They do not absorb its secretions, and consequently, when proper attention is paid to their cleanliness, they do not contaminate the breath, or become, in any way, offensive. They never change their colour. They are not acted on by the chemical agents found in the mouth; and hence the name incorruptible, which has been given them.

Such are the considerations that have induced me decidedly to prefer them to every other kind of artificial teeth. The objections that have been urged to their use, are, a want of congeniality between them and the mouth; their being better conductors of caloric than bone, and consequently, more liable to become cold when exposed to the air, &c.; but these have so little foundation, that, if they are compared with the advantages these teeth confessedly possess, they must be regarded as unworthy of notice.

SURGICAL TREATMENT OF THE MOUTH PREPARATORY TO THE INSERTION OF ARTIFICIAL TEETH.

The condition of the mouth is not sufficiently regarded in the application of artificial teeth, and to the neglect of this, the evil effects that frequently result from their use, are generally attributable. No artificial apparatus, no matter how correct it may be in its construction and in the mode of its application, can be worn with impunity in a diseased mouth. Of this fact, every day's experience furnishes the most abundant proof. Yet there are men in the profession, so utterly regardless of their own reputation and the consequences to their patients, that they wholly disregard the condition of their mouths, and are in the constant habit of applying artificial teeth upon diseased roots and gums, before the curative process, after having extracted the natural teeth, is half completed.

The dentist, it is true, may not always be to blame for omitting to employ the means necessary for the restoration of the mouth to health. The fault, oftentimes, is with the patient. There are many, who, after being fully informed of the evil effects which must of necessity result from such injudicious practice, still insist on its adoption. But the dentist, in such cases, does wrong to

yield his better informed judgment to the caprice or timidity of his patient, knowing, as he should, the lasting pernicious consequences that must result from so doing. If he is not permitted to carry out such plan of treatment as may be necessary to put the mouth of his patient in a healthy condition, previously to the insertion of artificial teeth, he should refuse to render his services.

Dr. Koecker, in treating upon this subject, says, "There is, perhaps, not one case in a hundred, requiring artificial teeth, in which the other teeth are not more or less diseased, and the gums and alveoli, also, either primarily or secondarily affected. The mechanical and chemical bearing of the artificial teeth upon such diseased structures, naturally becomes an additional powerful aggravating cause of the disease, already in a sufficient state of excitement, even if the teeth are mechanically well contrived and inserted; if, however, they are not well constructed, and are inserted with undue means or force, or held by too great or undue pressure, or by ligatures or other pernicious means for their attachment, the morbid effects are still more aggravated, and a general state of inflammation in the gums and sockets, and particularly in the periosteum, very rapidly follows. The patient, moreover, finds it impossible to preserve the cleanliness of his mouth; and his natural teeth, as well as the artificial apparatus, in combination with the diseases of the other structures, become a source of pain and trouble; and the whole mouth is rendered highly offensive and disgusting to the patient himself, as well as to others."*

The first thing then, claiming the attention of the dentist, when applied to for artificial teeth, is to ascertain the condition of the gums and of such teeth as may be remaining in the mouth. If either, or both be diseased, he should at once adopt such treatment as the circumstances of the case may indicate, but as this has been described in a preceding place, it is only necessary here to refer the reader for directions upon the subject, to what is there said.

When artificial teeth are to be secured in the mouth in any other way than on roots, sufficient time should elapse, before

* Vide, Koecker's Essay on Artificial Teeth, pp. 27, 28.

their insertion, for the completion of all those changes that follow the treatment which is usually necessary in such cases; otherwise, instead of being worn with comfort, they will be a source of constant irritation. If they are applied too soon, they will soon lose their adaptation to the gums. I have now in my possession, a number of parts of sets, which, from having been prematurely applied, and the changes in the shape of the parts on which they rested, that followed their insertion, pressed so unequally on the gums in the mouths from which they were taken, that their removal became absolutely necessary for the relief of the irritation and pain thus produced. The persons from whose mouths they were taken assured me, that at the time of their insertion they fitted very accurately, and were worn for a short time without inconvenience.

Nor was the irritation produced by their loss of adaptation, the only evil that resulted from their premature application; the vacant spaces thus occasioned became receptacles for particles of food and other extraneous matter, which by its retention became putrid, and imparted an exceedingly offensive odor to the breath.

The extent of the span of the maxillary arch is always lessened by the loss of the teeth and the wasting of the alveolar processes. The contraction thus produced is often equal to the width of one or two teeth, consequently in filling the aperture with artificial teeth, if the same number be used, they must be of a smaller size. Thus it is seen, that when artificial teeth are inserted too soon after the removal of the natural ones, the base on which they are placed is liable to lose its adaptation to the gums, and the correspondence of its circle with that of the alveolar ridge.

Sometimes it is necessary to wait eight or nine months, after the extraction of the natural teeth, before their place should be supplied with artificial ones. The wasting of the alveolar processes, however, has often progressed so far, before this operation is performed, that a much shorter time will suffice for the completion of the change in the parts that always follows the removal of these organs.

CHAPTER SECOND.

OF THE DIFFERENT METHODS OF APPLYING ARTIFICIAL TEETH.

IT has been already stated, that the utility of artificial teeth measurably depends on the manner in which they are applied, and in accordance with the plan laid down for the present part of my treatise, I shall now proceed to point out the peculiar advantages and disadvantages of the various principles upon which they are constructed and secured in the mouth.

In determining upon the particular mode of securing artificial teeth in the mouth, much ingenuity and practical judgment are often necessary; yet there are certain principles which, if well understood, will enable the practitioner, in almost every variety of case, to apply them in such a way, as to secure to the patient the greatest possible amount of benefit that can be derived from the operation.

The methods of inserting artificial teeth are, Firstly, on the roots of the natural teeth; Secondly, on a plate with elaps; Thirdly, with spiral springs; Fourthly, by atmospheric pressure and capillary attraction; Fifthly, with ligatures; and, Sixthly and lastly, by transplantation from the mouth of one person into the sockets of the teeth of another.

ON THE APPLICATION OF ARTIFICIAL TEETH TO NATURAL ROOTS.

This method of inserting artificial teeth, has, on account of its simplicity, been more extensively practiced than any other, and under favourable circumstances, is unquestionably the best that can be adopted. If the roots on which they are placed, be sound and healthy, and the back part of the jaws are supplied

with natural teeth, so as to prevent those with which the artificial antagonize from striking them too hard, they will subserve the purposes of the natural organs more perfectly and effectually, than any other description of dental substitute. When they are thus placed, they rest on a firm basis, and if they are properly fitted and secured, their connection with the natural roots cannot easily be detected. But unfortunately, the incisors and cuspidati of the upper jaw, are the only teeth which it is proper to replace in this way.

And the insertion of an artificial tooth on a diseased root, or on a root having a diseased socket, is always followed by injurious effects. The morbid action already existing in the root or socket or tooth, is aggravated by the operation, and often caused to extend to the contiguous parts and sometimes even to the whole mouth. Nor is it always proper to apply the tooth immediately after having prepared the root. If any irritation is produced by this preparatory process, the tooth should not be inserted until it has wholly subsided. The neglect of this precaution not unfrequently gives rise to inflammation of the alveolo-dental periosteum and alveolar abscess.

Although this method of inserting artificial teeth has received the sanction of the most eminent dental practitioners the world has ever produced, and is certainly the best that can be adopted for replacing the loss of the six upper front teeth; yet on account of the facility with which the operation can be performed, it is often resorted to under the most unfavourable circumstances, and in consequence of which, has been brought into a discredit it by no means deserves.

The efforts of the economy for the expulsion of the roots of the bicuspid and molar teeth, after the destruction of their lining membrane, are rarely exhibited in the case of those occupying the anterior part of the mouth. This circumstance has led me to believe, that the roots of these teeth receive a greater amount of vitality from their investing membrane, than do the roots of those situated farther back in the mouth, and that, though the amount of the living principle with which they are thus supplied, is inconsiderable, yet it is sufficient to prevent them from becoming obnoxious to their sockets.

The admission of this hypothesis can alone account for the fact to which I have just alluded, for it is well known that a dead root is always productive of injury to the surrounding parts, and that nature calls into action certain agents for its expulsion. Therefore, the insertion of a tooth on a completely dead root, is highly improper; but the fangs of the front teeth are rarely entirely deprived of vitality, and hence, after the destruction of their lining membrane, they often remain ten, fifteen, and sometimes twenty years, without very obviously affecting the adjacent parts.

Were the doctrines advocated by Mr. Bew and Dr. Koecker correct, the death of a tooth would be simultaneous with the destruction of its lining membrane, and the pivoting method, as it is commonly called, of fastening teeth, opposed to every correct principle of surgery. But, that the views of these gentlemen are erroneous, may be proven by boring into the cavity of the root of a tooth, towards its external surface, commencing within the alveolus. Before the instrument will have passed three-fourths of the way through, the root will become so sensitive as to incontrovertibly evidence the existence of vitality. In fact, the remaining of the root in its socket, without occasioning disease, is, of itself, sufficient proof that its vascular and nervous connexion with the general system is still kept up.

It is somewhat singular that these facts should have escaped the observation of these gentlemen; but that they have, is clearly manifest from their own remarks. Dr. Koecker tells us, that the vitality of the teeth is entirely dependent on their lining membrane, and that its destruction is followed by their immediate death.* Mr. Charles Bew, in treating on the circulation of these organs, after adverting to that of the general system, remarks: "It is just to take for granted, that through each tubified fang of the teeth, which the most sceptical observer, anatomist or not anatomist, may distinctly discern, the blood is anteriorly thrown to the interior of the tooth, and there, following a due course of beautifully organized circulation through the osseous part, is (si

* Principles of Dental Surgery, pp. 254, '5-'6 and 427.

interim nihil interfuerat) quietly returned by the periosteum of the exterior.”*

Dr. Fitch, in noticing the views of these gentlemen, observes, they “are both incorrect and contrary to facts, and the most correct analogical observations. We find that, in all hollow bones, of which the fangs of the teeth are a good example, that they have an external and an internal periosteum, and that the bone has an internal and an external periosteum, which, in their circulation, depend mostly upon these membranes; if the external dies, a part of the external bone dies, but no farther than the circulation depended on the dead membrane, and vice versa, when the internal periosteum is diseased or loses its vitality.”† This is a pathological fact that does not admit of cavil or doubt, and, so far as the teeth are concerned, especially those in the anterior part of the mouth, may be fully verified by boring in the root, as in the manner before described.

On the death, therefore, of the internal membrane of a tooth, the crown and internal part only, of the root, dies. This necrosis, so far as the author has been able to ascertain, extends but little more than half way through the root, and in this state it often remains, not being possessed of any powers of exfoliation, for years. So fully convinced has he been of this fact, that he has not hesitated, whenever he found a suitable root, to insert on it an artificial crown; and the success that has attended the practice, proves the principles upon which it is founded to be correct.

The observations of Mr. John Hunter, on the vitality of the roots of teeth, although he did not believe these organs to be vascular, are doubtless true. He infers, inasmuch as the roots of teeth do not decay as readily as the crowns, that they are endowed *with greater living powers*.‡

The vitality of the crowns of the teeth, being wholly derived from the lining membrane, cease, with its destruction; but the fangs, being supplied with a living principle, from an external, as well as from an internal membrane, retain a portion of their vitality as long as the external continues to exist, which, with those

* Bew on the Teeth, pp. 64-’5.

† Dental Surgery, part 2, p. 430.

‡ Vide, Hunter on the Teeth, part i. p. 138.

of the incisors and cuspidati, is not unfrequently for from fifteen to twenty years.

Thus it will be seen, that the death of the root of a tooth, is not simultaneous with that of its lining membrane; consequently, the objections of Dr. Koecker, based upon this supposition, to the pivoting method of inserting artificial teeth, is without foundation. I shall, therefore, conclude my remarks upon this subject, after briefly noticing one other objection, urged by the same gentleman.

“By the insertion of the pivot,” says he, “into the canal of the root, the natural curative process, in the decomposition and absorption of the fang, is either prevented or retarded; while, on the other hand, the most convenient outlet for a constant and regular discharge of the matter, which is always produced by the carious root in the surrounding soft parts, is obstructed; the matter, thus confined by this artificial obstruction at the point of the root, penetrates through the socket and gums, and forms gum-biles, or small fistulous abscesses, in the neighbourhood of the root.”*

This objection, although applicable to some cases, but not to all, may be obviated, by forming a groove on the side of the pivot sufficiently large for the ready escape of any matter that may form at the apex of the root. This method of giving egress to the matter thus formed, was suggested to the author about fourteen years ago, by Dr. L. S. Parmly, of New Orleans, and by adopting it whenever he had reason to apprehend the formation of matter, he has avoided the consequences mentioned by Dr. Koecker, as resulting from it. It is, however, in the fewest number of cases that matter forms, if the root be in a suitable condition for the reception of a tooth, and if it is not, it would unquestionably be better to remove it and apply a tooth on another principle. As a general rule, no root should be used that has been deprived of its lining membrane by inflammation and suppuration, or by the application of arsenic, as in either case there will generally be a formation of matter at its apex, which rarely happens, when it is destroyed by mechanical means.

* Essay on Artificial Teeth, p. 142.

The manner of preparing a root and inserting a tooth on it will hereafter be described.

ON THE APPLICATION OF ARTIFICIAL TEETH ATTACHED
TO A PLATE WITH CLASPS.

This method of inserting artificial teeth, is, perhaps, with the exception of the one just noticed, the best that can be adopted; and, on account of its more extensive applicability, may be considered as more valuable even than that. By this means, the loss of a single tooth, or of several teeth, in either or both jaws may be supplied. A plate may be so fitted to an aperture in the dental circle, and secured with clasps to the other teeth, as to afford a firm support to six, eight, ten, or even twelve artificial teeth.

Teeth inserted in this way, when properly executed, will last for many years, and sometimes during the life of the individual. But it is necessary to their durability, that they should be correctly arranged, accurately fitted and substantially secured to the plate, and that the plate itself be properly adapted to the gums, and attached to teeth that are firmly fixed in their sockets.

Gold is the only metal that should be employed for making the plate and clasps; and this, for the former, should be from twenty to twenty-one carats fine, and from eighteen to nineteen for the latter. If gold of an inferior quality be used, it will be liable to be acted on by the secretions of the mouth. Platina would, perhaps, answer the purpose, as well as gold; but there are so few, in this country, that understand working it, that the getting of it out into plate, and such other forms, as are required, would be attended with much difficulty and inconvenience.

The plate should be thick enough to afford the necessary support to the teeth; but not so thick as to be clumsy, or inconvenient from its weight. The clasps generally require to be about one-third or one-half thicker than the plate, and sometimes double its thickness. The gold used for this purpose, is sometimes prepared in the form of half-round wire; but, in the majority of cases, it is far preferable, that it should be flat; as such clasps afford a much firmer and more secure support to artificial teeth, than those that are half round; they also occasion less inconve-

nience to the patient, and are productive of less injury to the teeth to which they are attached.

Artificial teeth, inserted in this way, may be worn with the greatest comfort, and can be taken out and replaced, at the pleasure of the person wearing them; which, as it is important that they should be very frequently cleansed, in order to prevent the secretions of the mouth that get between the plate and gum, and the clasps and teeth that they are attached to, from becoming vitiated and irritating the soft parts, and corroding the teeth and tainting the breath, it should, on no account whatever, be neglected. Great care, therefore, should be taken to fit the clasps in such a manner as will admit of their being easily removed and replaced; and also that they may not exert any undue pressure upon the teeth to which they are fastened. If they press too hard upon them, they will occasion inflammation of their periosteal and alveolar membranes, and the gradual destruction of their sockets.

ARTIFICIAL TEETH WITH SPIRAL SPRINGS.

When attached to plates the only difference between the method last noticed, of inserting artificial teeth, and the one now to be considered, consists in the manner of confining them in the mouth. The former is applicable in cases where there are other teeth in the mouth, to which clasps may be attached; the latter is designed for confining whole sets, and parts of sets, where clasps, or any other means, cannot be employed for their retention in the mouth.

When plates are employed, the teeth are attached to them in the same manner as they are when clasps are used; but instead of being fastened in the mouth to the other teeth, they are kept in by means of spiral springs, one on each side of the artificial denture, between it and the cheeks, passing from one piece to the other.

Spiral springs are often required for confining only a lower set in the mouth, and sometimes for even parts of sets. When a number of teeth in the back part of the jaws are required, and, there are no teeth in the mouth to which clasps can be applied,

capable of affording a sufficient support, resort to spiral springs becomes indispensable. Various other kinds of springs have been used, but none that have been tried, seem to answer the purpose as well as these. When they are of the right size, and attached in the proper manner, they afford a very sure and convenient support. They exert a constant pressure upon the artificial pieces, whether the mouth be opened or closed. They do not in the least interfere with the motions of the jaw; and, although they may at first seem awkward, a person will soon become so accustomed to them, as to be almost unconscious of their presence.

OF THE ATMOSPHERIC PRESSURE AND CAPILLARY ATTRACTION METHOD OF APPLYING ARTIFICIAL TEETH.

The method last described, for the retention of artificial teeth in the mouth, is often found inapplicable and inefficient, especially in the upper jaw, and it is in such cases that the atmospheric pressure principle is especially valuable. It cannot, however, be advantageously applied for a less number than a whole upper set, because a sufficient surface of plate cannot be obtained for the atmosphere to act on, to afford the necessary support, and, for a like reason, the narrowness of the inferior alveolar ridge, will sometimes prevent the insertion of artificial teeth in the lower jaw upon this principle. In fact it is generally supposed to be wholly impracticable to use it in their application to the inferior maxillary, and the author was, for a long time, of this opinion, but he has succeeded so perfectly, that he now rarely finds it necessary to employ spiral springs in the insertion of double sets. He has quite recently applied six double sets upon this principle, which are worn without the slightest inconvenience.

The practicability of confining teeth in the mouth by this means, was formerly very much questioned, and, even at the present day, it is doubted by many. The principle, on which the plan is founded, may be simply illustrated, by taking two small blocks of smooth, flat marble, and exhausting the air from between them,—the pressure of the atmosphere on their external surfaces, will enable a person to raise the under block, by lifting the upper. In a similar manner, a gold plate, or any other substance impervious

to the atmosphere, and perfectly adapted to the gums, may be made to adhere to them.

The firmness of the adhesion of the plate, or base to which the teeth are attached, to the gums, depends on the size or depth of the alveolar ridge. If this is full and prominent, it will adhere with great tenacity, but if it is so shallow as to admit of its being moved horizontally, its retention will often be attended with difficulty. It is also important that the teeth should be so arranged and antagonized, that they shall strike all the way around those in the other jaw, at the same instant. This is a matter that should never be overlooked, for if they meet on one side, before they come together on the other, the part of the plate or base not pressed on, will be detached, and by admitting the air between it and the gums, it will cause it to drop.

The application of artificial teeth, on this principle, has been practised for a long time; but the plates formerly used, were ivory, instead of gold, and could not be fitted with sufficient accuracy to the mouth to exclude the air; so that, in fact, it could hardly be said, that they were retained by its pressure. The retention of the ivory plate is not effected by the pressure of the air, but is the result of adhesive attraction, and this is generally so slight, that it is constantly liable to drop. Moreover, it is so awkward and clumsy, that the teeth cannot be worn with any degree of satisfaction; and the ivory absorbs the fluids of the mouth so readily, that, after having been worn for a few weeks, it becomes exceedingly offensive.

I have seen many sets of teeth fixed on plates, or rather blocks, of ivory, and many that were composed altogether of this substance; and, in one instance, prepared a set myself; but the objections above stated were so palpably manifest, that I determined never again to attempt the insertion of artificial teeth upon this principle. Having, however, been called upon, about ten years ago, by a lady whom I highly esteemed, for a set of upper teeth, and, finding that they could not be confined in the mouth by any other means, I was reluctantly induced, after having stated to her all the objections, to undertake their insertion. Instead, however, of using, as formerly, a plate carved from the ivory of the hippopotamus's tooth, I determined to employ one of gold. I accord-

ingly had it made so as to fit all the inequalities of the gums; and after having fastened the teeth upon it, in the manner to be hereafter described, placed it in the mouth; and having exhausted the air from between it and the gums, had the satisfaction to find that it firmly adhered, and that the teeth enabled the lady, (to use her own words,) to "speak and eat with perfect ease." These teeth still continue to answer all the purposes that can be expected from artificial teeth, under the most favourable circumstances, and I have since inserted from thirty to fifty sets on the same principle, and with like success; and have also seen a number of sets inserted by Dr. Noyes, and other dentists,—and most of which answered a good purpose.

The firmness with which teeth, fastened on this principle, can be made to adhere to the gums, and the facility with which they can be removed and replaced, render them, in many respects, more desirable, than those fixed in the mouth with clasps. But, unless judgment and the proper skill be exercised in their preparation, a total failure may be expected, or, at least, they will never be worn with satisfaction and advantage.

Many, in attempting to insert artificial teeth in this way, have failed of success, and, in consequence, have condemned the principle, when, in reality, the fault was attributable to some defect in the preparation of the teeth, or of the fixtures with which they were connected. Many of the failures, are owing to their premature insertion, for, however well the plate, upon which the teeth are fixed, may fit the gums at the time of its application, it will soon lose its adaptation, if it be applied previously to the completion of the changes in the alveolar ridge, that follow the removal of the natural teeth. When this happens, the air gets between the plate and gums, and the whole apparatus, as a natural consequence, drops; whereas, if a sufficient time is allowed for the completion of the changes, just alluded to, it will continue to adhere to the gums. Another very frequent cause of failure is, a want of proper adaptation in the first instance. Unless the plate be made to fit the gums with the most perfect accuracy, the pressure of the atmosphere cannot be expected to confine it to them.

There are but few writers on this branch of dentistry, who have even so much as adverted to this mode of applying artificial teeth. Drs. L. S. Parmly and Koecker, have each bestowed on it a passing notice. The former of these gentlemen, in alluding to the subject, thus remarks: "Where the teeth are mostly gone in both, or in either of the jaws, the method is, to form an artificial set, by first taking a mould of the risings and depressions of every point along the surface of the jaws, and then making a corresponding artificial socket for the whole. If this be accurately fitted, it will, in most cases, retain itself sufficiently firm, by its adhesion to the gums, for every purpose of speech and mastication."*

It is not, as has been before stated, expedient to apply parts of sets upon this principle, nor did I for a long time believe the pressure of the atmosphere and capillary attraction would give to a lower set, because of the narrowness of the alveolar ridge of the inferior maxillary, sufficient stability to render it at all serviceable, but experience has fully demonstrated its practicability.

Dr. Koecker tells us, that he has "been completely successful in several instances, in the application of sets for the upper jaw in this manner;" and says, they "should be made either with a gold plate, mounted with natural or artificial teeth, or of one picce of hippopotamus's tooth."† Having already stated the objections that exist to the use of this substance, I cannot join with Dr. K. in its recommendation. At the time when I first substituted the gold plate for it, I had not seen his late work on artificial teeth, and consequently was not aware that this metal had ever before been used.

THE LIGATURE METHOD OF FASTENING OR APPLYING ARTIFICIAL TEETH.

The ligature method of fastening artificial teeth in the mouth, is, perhaps, with the one next to be considered, the most objectionable of all. It is one, which no scientific practitioner can, under any circumstances, approve. A description of it is, there-

* Practical Guide to the Management of the Teeth, pp. 138-'9.

† Koecker on Artificial Teeth, p. 92.

fore, wholly unnecessary. But it may be well to notice some of its principal objections.

First.—Teeth cannot be fastened in the mouth with ligatures sufficiently tight, to be worn with comfort; and from their constant liability to be moved, by the least motion of the lips or tongue, are a source of constant annoyance.

Second.—In order that they may be secured in the mouth by them, the teeth must be so constructed, as to fill the whole aperture in the dental arch; which is not always desirable, and, when the places of ten or twelve natural teeth are to be supplied, must give the apparatus a very awkward and clumsy appearance.

Third.—Teeth, when confined in the mouth, by this means, must be made of ivory, and this, as has been before shown, is unfit to be employed for this purpose.

Fourth.—They cannot so readily, as when fastened in the mouth with clasps, be taken out and replaced, and,

The fifth and greatest objection to this method is, that the ligatures, by their constant strain, cause the natural teeth to which they are attached, to loosen, and finally to drop out. I have known this to occur in many instances; and indeed, in every case that has come to my notice, where artificial teeth had been thus confined, and worn for any considerable length of time, this has been the result. Dr. Fitch mentions the case of a lady, who had a central incisor inserted in this manner, which, in the course of four or five years, occasioned the loss of the other central incisor. She was then supplied with two artificial central incisors, fixed in the same manner; this produced the loss of one of the laterals; these were afterwards inserted, and the loss of the other lateral soon followed. In like manner the aperture was again supplied, and was soon followed by a similar result; one cuspidatus fell out, and the other was much loosened, and partially drawn from its socket. Dr. F. also gives another case, of a somewhat similar character; the subject of which was also a lady. "She had," says he, "had several sets of teeth placed in her mouth, at different times, as in the case of Mrs. A." (the subject of the case just alluded to,) "and, like her, disease, probably induced or aggravated by her artificial teeth, had destroyed nearly all her back teeth, and the artificial ones had done the same for most of her

front teeth, nearly as in the case of Mrs. A——; but in that of Mrs. O——, (the subject of the present case,) “the canine teeth were very firmly placed in their sockets, so as not to be readily moved by the weight of the other teeth; and the ligatures, instead of pulling them out, cut them off. At the time when her last set of artificial teeth were inserted, she had lost all of her upper teeth except the right canine tooth. The left canine tooth had been cut off by the ligatures of the set preceding these last, and to the stump of this tooth a silver screw was fastened, and to this screw and the right canine tooth, the last set of artificials was secured by ligatures. When she called on me, the ligature had cut off the right canine tooth, and the set dropped out.”*

Artificial teeth, fastened in the mouth in this manner, is almost certain to be followed by one or other of the effects described by Dr. F. If the teeth to which the artificial apparatus is secured, be too firmly fixed in their sockets, to be easily loosened, the vitiated secretions that collect between the ligatures and the necks of the teeth to which they are attached, will, sooner or later, corrode and cut them off. Of the pernicious effects that result from ligatures around the teeth, I have known many instances. The following is one:

A lady of this city, Mrs. H——, had four upper incisors fastened with ligatures, which, in a few years, occasioned the loss of the cuspidati—the teeth to which they were attached. She then had six others inserted in the same manner, and the loss of the first right bicuspid soon followed. In this way, she was supplied with set after set, until not a single tooth in the upper jaw, on the right side, remained, and only one, the second molaris, on the left,—the *dens sapientiæ* having been previously destroyed by caries. To this second molaris, a block of teeth, made from hippopotamus ivory, nine in number, were confined by means of a wire ligature, and at the time she applied to me for advice, the corroding matter that had been retained between it and the tooth, had cut the latter more than half off. I recommended the immediate removal of the artificial teeth, together with that of the tooth to which they were attached, and also the roots of the *dens sapi-*

* Dental Surgery, part 2, pp. 422-’3-’4.

entia. To this, after an assurance from me, that she could be supplied with a much better set, she submitted.

That injurious effects should be thus produced, is not a matter of any surprise, when we consider, that the teeth to which the ligatures are tied, are, by the constant force exerted on them, caused to press against the sides of their sockets next the artificial teeth; and this, as a natural consequence, gives rise to inflammation of their alveolar and investing membranes, and not unfrequently to disease in all the parts of the mouth.

Dr. Koecker, in speaking of teeth fastened in this manner, observes, "The injury produced by this kind of artificial teeth, is always certain; and the use of one or more teeth of this kind, is always a certain forerunner of the gradual destruction of all the natural teeth, and the consequent application of a whole double set of artificial teeth, if artificial teeth, prepared and inserted under better surgical skill, is not resorted to."

One would suppose that a practice that is fraught with so many evil consequences, and which might be so easily avoided, would not, in the present advanced state of dentistry, be adopted; but that it still exists, we have many lamentable proofs, even in our larger cities, where the art is practised in its greatest perfection.

J. Patterson Clark, author of a popular treatise on dentistry, remarks: "So backward is the state of the art, that in London, many dentists fasten false teeth to the adjoining firm ones, by means of silk ligatures; this will, of course, keep them in their place, although dangling and loose, until those to which they are made fast, drop out, which, in general, is very soon the case."

THE TRANSPLANTING METHOD OF INSERTING ARTIFICIAL TEETH.

The sixth, and last method of replacing teeth, consists in inserting a tooth, while warm and fresh from the mouth of one person, into the socket of a tooth of the same class, previously vacated for its reception, in the mouth of another. This practice, though once quite popular, is now very seldom adopted. I have met with but one instance of the kind, and in this, the tooth never

became firm, but was a constant source of irritation during the whole time that it was permitted to remain. Dr. Koecker mentions five cases of a like character, that came under his own immediate observation.

In some instances, where teeth have been thus transferred, an imperfect vascular and nervous connection with the general system has been established; but, in order that even this may take place, it is necessary that the tooth should fit accurately the new socket, which can but very rarely happen.

So highly esteemed was this operation by Mr. Hunter, that he asserts that he has known even dead teeth to grow, when placed and allowed to remain in foreign sockets. I can account for this palpable error of Mr. H. only by supposing that his practical observations on the teeth were not sufficient to enable him to distinguish between a living and a dead tooth.

To say nothing of the turpitude and cruelty of thus mutilating and disfiguring one person for the gratification of another, the operation itself is one which is very painful, and sometimes even dangerous. Mr. Hunter, however, denies that any danger is to be apprehended from the operation itself, and attributes the alarming symptoms, that occasionally follow it, to the deranged sympathies that are excited by the principle of irritation. The incorrectness of his opinion is, I think, fully established by the following case, given by Dr. Watson, and inserted in "The Medical Transactions of the College of Physicians."

"An incisor tooth of the upper jaw, from an unknown cause, becoming carious, in a young unmarried lady, about twenty-one years of age, it was extracted, and its place very dextrously supplied by a like tooth from another young woman, who, upon examination for the purpose, appeared to be in good health. The seion tooth very rapidly took a firm hold, and soon bid fair to be of great service and ornament. In about a month, however, the mouth became painful, the gums inflamed, discoloured, and ulcerated. The ulceration spread very fast, the gums of the upper jaw were corroded, and the alveoli left bare. Before the end of another month, the ulceration stretched outwardly under the upper lip and nose, and inwardly to the cheeks and throat, which were corroded by large, deep, and fetid sores. The

alveoli soon became carious, several of the teeth gradually dropped out, and, at length, the transplanted tooth, which had hitherto remained firm in its place.

"About this time, blotches appeared in the face, neck, and various parts of the body, several of which became painful and extensive ulcers; a considerable degree of fever, apparently hectic, was excited; a copious and fetid discharge flowed from the mouth and throat, which impeded sleep, and the soreness of the fauces prevented a sufficiency of nourishment from being swallowed.

"The wisest plan would probably have been to have commenced from the first with a mercurial process before the system was so far debilitated, and the general health so deeply encroached upon, as to render any plan of very little use. An antiseptic course, however, of bark and other tonics were first tried, and persevered in till found to be no service whatever; and calomel pills, in an alterative proportion, were then had recourse to in their stead. This plan was found to soften every symptom, and totally to eradicate many; but the bowels were soon affected with severe pain and purging, and the calomel was exchanged for strong mercurial ointment, which, from the present debility of the patient, soon produced a like effect, and an effect that could not be corrected by opium. The venomous taint or putrescent tendency, though occasionally driven back, as often rallied, and, at length, prevailed; and the patient fell a victim to it in the greatest distress and misery. The person, from whom the tooth had been taken, had, in the meantime, continued in perfect health; and, upon a minute inspection as well of the sexual organs as of the mouth, evinced not the slightest syphilitic affection.

"The case is mysterious, and leaves much ground for the imagination to work upon. If it be difficult to conceive it to have been syphilitic, it is more difficult to conceive it to have been any thing else. But the grand lesson to be learnt from it on the present occasion is that of the wariest caution, and a caution amounting almost to a prohibition, in remedying a deficiency of teeth by transplantation."*

* Good's Study of Medicine, vol. i. pp. 75-76.

Other cases of a similar nature might be adduced, but this will suffice to show the danger with which the practice is attended, even when the tooth is taken from the mouth of a person in apparent health.

CHAPTER THIRD.

OF THE MANNER OF PREPARING A NATURAL ROOT AND INSERTING A PIVOT TOOTH.

PREVIOUSLY to the preparation of a natural root for the reception of an artificial tooth, the remaining teeth and gums, if diseased, should be restored to health. This done, such portion of the crown, as may not have been previously destroyed by decay, should be removed by means of an oval or half round file and a pair of excising forceps. If the tooth is not much decayed about its neck, it should be cut about half off with a file, before the forceps are applied, and even then they should be used with care, in order to prevent jarring or otherwise injuring the root.

The excising forceps should be strong, so as not to spring under the pressure of the hand of the operator, and their cutting edges about an eighth of an inch wide.

After the removal of the remaining portion of the crown, the nerve, if still alive, should be immediately destroyed, by introducing a silver or iron wire, or some other small sharp-pointed instrument, as far up into the canal of the root, as it may be desirable for the pivot to extend, giving it at the same time, a quick rotary motion. It is important that the instrument used for this purpose, if it be of metal, should be soft and yielding, otherwise, any sudden motion of the head might break it off in the tooth.

Some recommend destroying the nerve with the actual cautery, by the introduction of a hot wire into the canal of the root, but as this is very liable to produce irritation in the surrounding tissues, the other method is far preferable.

The nerve having been destroyed, the balance of the operation will be unattended with pain. The root should now be filed off up to the gum and a little above its free edge, with a file such as I

have before mentioned.* The exposed extremity of the root after having been thus filed, will present a slightly arched appearance, corresponding with the festooned shape of the anterior margin of the gum.

After having completed the operation of filing, the natural canal in the root should be slightly enlarged with a burr drill, or a broach prepared for the purpose. The canal thus formed in the root for the pivot, should never exceed the sixteenth part of an inch or a line in diameter, and a quarter or three-eighths of an inch in length.

If from any peculiar susceptibility of the patient, there should be reason to apprehend inflammation of the alveolo-dental membrane, the tooth should not be immediately inserted. Dr. Fitch recommends filling the cavity in the root with lead, for the reason, as he believes, that this metal has a tendency to assuage or rather to prevent the inflammation which might otherwise arise from the operation of filing. With regard to the value of this recommendation, I cannot speak with certainty, not having adopted the practice but in one or two cases.

But when the nerve in the root is destroyed in the manner first described, it very rarely happens that inflammation supervenes, but if a root is employed in which the lining membrane has been previously destroyed, it is almost certain to follow the operation, unless an outlet is made, by cutting a groove on the side of the pivot, for the escape of the matter that is almost always formed, at the apex of a dead root.

After having prepared the root in the manner as just described, an artificial crown of the right shape, colour, and size, should be accurately fitted to it. It should touch every part of the filed extremity of the root, and made to rest firmly upon it, and at the same time be in an exact line with the circle of the other teeth. The practice of fitting the crown to the root anteriorly, and leaving an opening posteriorly, as is often done, should be carefully avoided, for the reason that any opening here, affords a lodgment for foreign matter, which soon becomes putrid and offensive, and

*The file employed for this purpose should be of the best quality, and it should be double or cross cut and rather coarse than otherwise. Stub's should be preferred to any other manufacturers.

the tooth itself is rendered less secure by it. The new tooth should also be so fitted, as not to press against the adjoining teeth, or strike its antagonist before the other teeth come together. In the former case, it would give rise to inflammation of the socket of the root, and in the latter, it would soon be displaced.

The canal in the root, and that in the artificial crown, should be directly opposite to each other. When the crown of a natural tooth is used, the proper place for the pivot hole is indicated by the pulp cavity, but when a porcelain tooth is employed, if great care has not been taken in its manufacture, considerable difficulty will be experienced in its insertion.

If a porcelain tooth is to be used, one should be selected of the proper length, width, and thickness. It should be as nearly as possible the shade of the adjoining teeth, and it would be preferable to have it even a little darker than any lighter, as in the former case, the contrast would be less perceptible than in the latter. If it is necessary to make any change in the shape of the tooth, it may be readily effected on a small grind-stone or emery wheel. A great number of grinding apparatuses have been invented for this purpose. Some are very simple in their construction, consisting of a single wheel, turned with a crank, others are more complex in their arrangement: but the object may easily and readily be accomplished with any now in use. Those of the simpler construction are kept by most instrument makers, from whom they can be procured.

When the crown of a natural tooth is employed, any change which it may be necessary to make in its shape, should be effected with a file. To obviate the difficulty sometimes experienced in making a perfect joint between the root and crown, Dr. E. Townsend, of Philadelphia, has recently invented two very ingenious instruments, consisting of an oval and a hollow file—the former fitting exactly into the latter. With the first he files the root, and with the other, the base or part of the crown to be fitted to it.

The artificial crown may be secured to the root by means of a pivot made of wood or metal, and when the latter is employed, gold or platina should be preferred, inasmuch as silver or any baser metal is liable to be oxydized by the fluids of the mouth.

If wood be used, it should be of the best quality of well seasoned white hickory, as this possesses greater strength and elasticity than any other that can be procured in this country. After being reduced to near the size of the orifice of the cavity in the artificial tooth, it should be forced through a smooth hole, of the size of that, in a piece of ivory, bone, steel, or some other hard substance, for the purpose of compressing its fibres as closely together as possible. Thus prepared, one end of it should be forced into the cavity in the artificial crown, and the projecting part cut off about a quarter or three-eighths of an inch from the tooth, and this, after being fitted to the size of the orifice in the root, should be inserted in it; pressure should now be applied with the thumb and finger of the operator, to the tooth, and the pivot forced up into the canal in the root until the two come together. The part of the pivot going into the root, should never be so large as to require any other pressure than can be applied in this way for forcing it into the root; as the swelling of the wood will soon render it sufficiently tight to hold it firmly in its place. The practice of driving up a pivot with a hammer, as is often done, is a bad one. It is often followed by inflammation and suppuration of the soft tissues about the apex of the root.

A porcelain tooth with a wood pivot, previously to insertion, presents the following appearance.

When a metallic pivot is used, the end going into the artificial crown may be fastened in either of the following ways, namely, First, by cutting a screw on it, either with a file, or by passing it through a screw-plate; the cavity in the crown should next be filled with a wooden tube, and this then screwed into it. Second, by filling the cavity in the crown with pulverized borax moistened with water, inserting the end of the pivot, which should be large enough to fill the cavity, into it, placing several small pieces of solder around it, and applying heat to the tooth by means of a blow-pipe and lamp until it fuses and flows down around it into the tooth. The solder, by adapting itself, when in a state of fusion, to the rough walls of the cavity in the crown of the tooth, will prevent the

FIG. 52.



pivot from loosening or coming out. The latter method, I consider far preferable to the former. The projecting part of the pivot should be about half an inch in length, square and pointed. The cavity in the root of the tooth, which requires to be deeper for a metallic than for a wood pivot, should be filled with wood, with a small hole through its centre. Into this the end of the pivot should be introduced and forced up, in the manner as before described, until the tooth and root come firmly together. The following is the appearance of a porcelain tooth prepared with a metallic pivot, for insertion.

FIG. 53.



The author has been in the habit, for a number of years of using a pivot, consisting of gold encased in a thin layer of wood. It is made in the following manner;—the gold is first made into wire of the proper size, and passed through a screw-plate. A hole is then drilled lengthwise into a piece of well seasoned hickory as far as is required for the length of the pivot. Into this the wire is screwed, and then cut off close up to the wood, which is reduced with a file or knife to the size of the orifice in the artificial crown, and firmly forced into it. The projecting part of the wood, to the termination of the wire, is trimmed down to the size of the cavity in the root, and cut off, when the tooth is ready for insertion.

This kind of pivot, he conceives to be, in many respects, preferable to any other. The wood prevents the gold from enlarging the cavity of the root, or that of the artificial tooth; and, at the same time, by the swelling of the wood, the pivot is firmly retained in both. The gold keeps the artificial tooth from being moved, as often happens, when a wood pivot alone is used, after it becomes saturated and softened with the juices of the mouth.

The gold employed for pivots should be eighteen carats fine, and the wood which I have found best suited to the purpose, is firm, close-grained, and well seasoned hickory. The cavity in the root should be cleansed from all extraneous matter, previously to the insertion of the tooth.

The artificial crown should be first fitted to the root with a

temporary pivot, of soft wood, in order the more readily to ascertain in what manner the permanent one should be shaped, so as to make the tooth fit, and also to avoid the necessity of removing it after it has been firmly inserted.

There is some diversity of opinion with regard to the kind of pivots that should be used. Some prefer those made of wood; others, those of metal. Dr. Fitch, on this subject, observes: "The metallic pivots are far better than any other; and their only objection is, that they are apt to wear the tooth, that is placed upon them, and the stump in which they are inserted; and so much so do they have this effect, that we are induced to use pivots of wood. This last has the advantage, if perfectly seasoned, of swelling in the stump, by the moisture which they absorb; and, in this way, become very firm. The advantages and disadvantages, of the two kinds, are, perhaps, nearly balanced."

To the use of wood pivots, however, Dr. Koecker is decidedly opposed. "The pivots," says he, "should be made only of fine gold or platina; every other metal, such as brass, copper, silver, and even inferior gold, are highly objectionable, being more or less liable to corrode, and thus become injurious to the other teeth, and the general health. There is, however, a practice, which is still more improper, namely, the use of pivots made of wood: these pivots, after insertion, considerably expand, from the moisture of the mouth, and consequently remain perfectly firm in the roots for several years, which deceive not only the patient, but the dentist also, and induces them to consider the case very successful, until they at last find that the root is either split by the swelling of the pivot, or nearly destroyed by the rapid decay of the wood in the cavity, which, by its chemical and mechanical irritation, is very apt to produce very serious inflammation, and other affections of the gums and sockets; and, not the least objection, the disagreeable breath, which must be an unavoidably concomitant of this practice."

Again, on the insertion of pivoted teeth, Dr. K. in another place, adds: "I have made it an universal rule to insert the tooth in such a manner, that the patient should be capable, after receiving the necessary instructions, to remove it, and replace it, at pleasure;

for this purpose, I have found it best, and most effectual, to wind a little cotton round the pivot, which should be filed somewhat rough previous to its insertion into the fang."

The description here given of the effects arising from the use of a pivot of wood, is, perhaps, somewhat exaggerated. If it be inserted with proper care and judgment, it is no more liable to produce irritation and to affect the breath, than a gold one, wrapped with cotton, or one made of any other metal. The fact that wood pivots remain firmly in the root for several years, ought rather to be considered as a recommendation, than an objection; and with me, I must confess, it would go far towards determining my preference in their favour; for observation has taught me, that the frequent removing and replacing of a pivoted tooth, greatly tends to hasten the destruction of the root, and to affect the surrounding parts with disease. But a wood pivot should never be so large as to split the root by swelling.

It should, therefore, never be so large as to require any greater force for its insertion into the root than can be applied with the thumb and forefinger of the operator.

It sometimes happens that the natural root instead of occupying a verticle position in the jaw passes up obliquely, so that if the pivot connecting the artificial tooth to it be straight, the latter will either overlap one of the adjoining teeth or project forwards or point towards the interior of the mouth. To obviate this, an angle should be given to the pivot, immediately at the point of junction between the tooth and the root. A little practice will enable the operator readily to overcome a difficulty of this description.

Again, it sometimes happens that cases are met with presenting a still more formidable difficulty; as for example, when the root is situated behind the circle of the other teeth, and to obviate which, a different kind of tooth, and an entirely different course of procedure is necessary. In a case of this sort, after having prepared the root in the manner as before described, an impression of the parts should be taken with bees-wax, from which a plaster model should be obtained, and from this two metallic casts.

Between these last a gold plate extending just far enough baek to cover the root and forward to form a line with the outer circle of the teeth. To the inferior part of the plate covering the root, and directly over the cavity in it, a gold pivot, about three-eighths of an inch long, should be soldered, and to the anterior part of it a plate tooth of the right size, shape, and shade, should be attached. The cavity in the root should now be filled with a piece of hollow wood, and into this the gold pivot, after being filed to a point, should be forced.

A description of the manner of obtaining an impression with wax, of procuring a plaster model, metallic casts, of fitting a plate and attaching teeth to it, will be hereafter described. It is not necessary, therefore, to dwell minutely upon this part of the subject here.

CHAPTER FOURTH.

THE MANNER OF FITTING A PLATE, ATTACHING CLASPS AND PORCELAIN TEETH TO IT.

IN the construction of a dental substitute of this description, it is necessary, in the first place, to obtain an exact model of the parts upon which it is to rest and to which it is to be attached. This may be procured in the following manner:

FIG. 54.



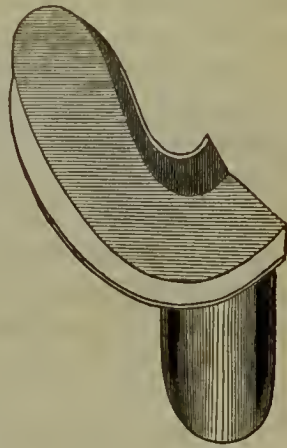
Fill a frame of suitable dimensions, like the one represented by Fig. 54, made of silver or tin, with white or yellow wax, softened in warm water or by a fire, until it is of the consistency of dough or putty; and after having done this, put it in the mouth with the wax facing the jaw to be supplied with artificial teeth and press up carefully against it, covering the whole of the vacant space and the adjoining teeth as far back as it may be necessary to extend the plate.

The pressure on the frame should be sufficiently great to completely embed the teeth and the alvcolar ridge in the wax. The frame should be held steadily in the hand of the operator, and the pressure should be applied to every part of it alike. The wax should be pressed up against the gums on each side with the finger, so that an exact impression may be obtained of all the depressions and protuberances of the parts on which the plate is

to rest and of the teeth to be embraced by the clasps. On the removal of the frame and wax from the mouth, the greatest precaution is necessary to prevent injuring or altering the shape of the impression.

Every dentist should be supplied with several of these frames, differing in size, so that he may never be at a loss for one of the right dimensions. When it is not necessary to take an impression of only the front part of the alveolar ridge or the teeth of one side of the jaw, a frame like the one represented in Fig. 55, will be found most convenient, but when such are used it is necessary to have one for each side of the jaw.

FIG. 55.



Dr. Elliott recommends that the wax-frame be "formed by being swedged up between a model and counter model, in the same way that a gum plate is fitted to the mouth."* Wax-frames thus formed would doubtless be rather more convenient than those which I have described, but with care an accurate impression can readily be obtained with either.

After removing the impression from the mouth, it should be oiled with a camel's-hair pencil or brush previously dipt in olive-oil, and a wire about three-fourths of an inch long, stuck in the centre of the bottom of each cavity made in the wax by the teeth next the vacant space and those to which the clasps are to be applied, to prevent the liability of these on the model being broken.

The impression thus prepared should be filled with a paste made of the best calcined plaster of Paris, (gypsum) and water. This, at first, should not be thicker than thin batter, but after the impressions made by the teeth have been filled, it may be made a little thicker by stirring in a little more plaster, and the balance of the impression filled. The plaster should be raised an inch higher than the wax.

* American Journal of Dental Sciences, vol. v. p. 90.

The plaster, after being calcined, should be passed through a fine seive. It is important that this should be of the very best quality, such as is employed in the manufacture of plaster busts.

After the plaster has sufficiently hardened, it should be trimmed, and after softening the wax in warm water or by a fire, it should be removed from it. The same impressions can often be used a second or a third time, but lest the shape of it should be altered in the removal of the model, a duplicate impression should be taken. The plaster model should be shaped with a knife, so that a metallic cast obtained from it may be easily withdrawn from an impression of the same or a similar material.

A correct plaster model having been obtained, the next thing to be attended to, is to procure a metallic model and counter model, which may be done in either of the following ways:

First, by making an impression in sand, such as is used in iron or brass foundries, and afterwards filling it with some fused metal, block-tin or lead. When this becomes cold, it should be turned over and partially buried in the sand, leaving only so much of it as represents the shape of the gums and teeth projecting, which should be encircled by a rim of brass or sheet iron, an inch or an inch and a half in width. Upon the projecting part of the model, fused lead or block-tin should be poured until the rim is nearly filled. When this has become cold it may be removed from the rim.

Second, by pouring fused lead into a sheet or cast-iron cup or box, of about four inches in diameter and three in depth, until it is about half filled, and immediately immersing so much of the plaster model in it, as represents the shape of the gums and teeth, if the latter be left on the model, and holding it there until the lead has become chilled, when it should now be removed and the whole upper surface of the lead, including the impression, covered with a thin coating of paste, made of whiting and water, of the consistence of cream. For the application of this a camel's-hair pencil will be found most convenient, and after it has become perfectly dry, the box or cup, should be filled with fused block-tin, but at a temperature so low that it will not char or even discolour white paper when dipt and held in it. This precaution is necessary to prevent the union of the two metals.

The last described method of obtaining metallic casts, the author prefers to the first.

By cutting the teeth from the plaster model, before obtaining metallic casts, the operator will be able to fit his plate more perfectly and with less difficulty to the teeth, around which the clasps are to be placed, than can be done when they remain, for in the former case he need not cut it to fit the vacant space and the teeth until it has been struck up to the model, while in the latter, this must be done first, so that in swedging it up, it is almost always drawn to a greater or less distance from them.

The operator, after having provided himself with a metallic model and counter model, should make a sheet-lead pattern of the size and shape of the alveolar ridge, as far back as he intends the plate to extend. The dimensions of this should be marked on gold plate, which should be cut accordingly with a pair of strong shears, or snips as they are more commonly called. The gold should now be adjusted and partially fitted to the model with a hammer and pair of pliers, and after being well annealed should be placed between the two casts and struck up with a heavy hammer. This done, it should be filed to fit the aperture and the teeth to which it is to be clasped, when it should be again annealed and again struck up between the casts and closely and accurately fitted to the parts on which it is to rest.

Of the width of the plate the reader will be able to form a pretty correct idea, from the illustrations that will be given a little further on.

The plate should now be placed on a second plaster model or one from which the teeth have not been removed, which, if it has been obtained from the wax impression from which the first was procured, or from another taken with the same degree of care, it will fit with perfect accuracy.

Having fitted the plate, the operator should adapt his clasps to the teeth, one on each side of the mouth, and here it may be proper to repeat what I have before stated, that the gold employed for this purpose should be about one-third or one-half thicker than the plate. The clasps should also be as wide as the teeth to which they are applied will admit of their being made, and when carefully fitted, they should be attached to the

plate by means of a small piece of bees-wax, previously softened, placed on the plate and the inner or palatine side of each elasp. The plate with the elasp should now be taken from the plaster cast without moving the latter, and laid, with the waxed side downwards, on a piece of paper. A sufficient quantity of plaster of Paris, mixed with water until it is of the consistence of thick batter, should be poured on the upper side of the plate and elasp to hold them firmly together. After this has become dry, the work may be turned over, placed on a piece of chareoal, and the wax softened and removed, when it is ready for soldering.

For this process the operator should be provided with a spirit or oil lamp, capable of holding, at least, a pint of alcohol or oil, and with a spout, three or four inches long and three-fourths of an inch in diameter; and a blow-pipe of from fifteen to eighteen inches in length, with a tolerably large orifice. When a spirit lamp is used, and the author is of the opinion that it is preferable to oil, the wick should be large enough to fill the spout, to prevent the flame from extending back through it into the body of the lamp and causing an explosion, which is almost certain to happen when this precaution is not observed. Hook's self-acting blow-pipe, as improved by Dr. Jahial Parmley, of New York, is highly recommended by some dentists. It consists of two hemispheres, and it has been rendered still more powerful by an improvement made by Dr. W. H. Elliot, of Platsburg, N. Y. who has kindly furnished the author with the following description and drawing of the self-acting blow-pipe as improved by himself.

THE SELF-ACTING BLOW-PIPE.

"This ingenious contrivance, useful as it may be to the dental artist, in its simple form, is far short of what it may be rendered simply by supplying it with a larger quantity of the supporting principle of combustion.

The fact, that the centre of the flame of the self-acting blow-pipe, contains no oxygen, is well known to every enlightened dentist, and may be proven by placing a rod of polished metal in the flame for a few seconds, in which case it will be seen that the surface of that portion of the rod, occupying the centre of the

flame does not unite with oxygen, however great the degree of heat may be; but if a jet of atmospheric air, be thrown into the flame upon the rod, it will oxydize as readily as if heated by any other means. This little experiment, proves not only the want of oxygen in the flame, but it leads to a very important conclusion, that without oxygen, the burning of the vapour must be gradual and imperfect. In consideration of this fact the writer was led to make another experiment, that of producing a more perfect combustion, by throwing into the flame one of its supporters. This may be done in several ways, but the simplest and most convenient is atmospheric air, thrown in by means of a bellows. For this purpose the exhalations of the lungs will not do as well, inasmuch as they not only contain less oxygen, but also contain a large portion of carbonic acid, which neutralizes so much of the remaining oxygen as to render it unfit for the support of combustion.

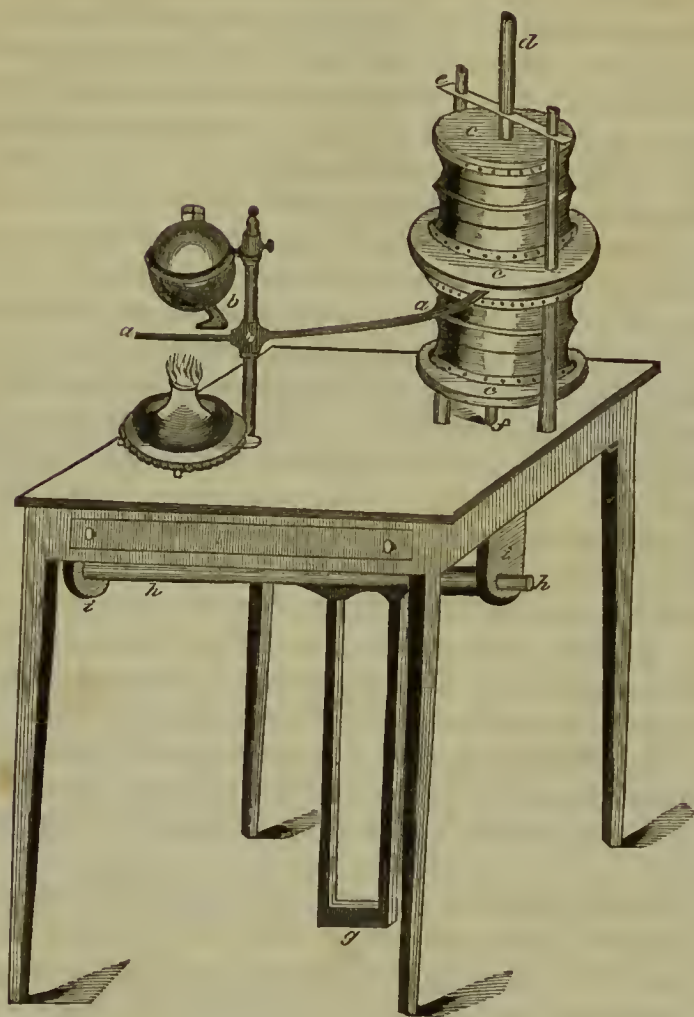
The air-pipe must pass along by the vapour pipe, and discharged about an inch and a half beyond it, in the very centre of the flame, and in precisely the same direction. The caliber of the air-pipe at its apex, must be equal to that of the vapour pipe; it must be made as small as possible without being enlarged at the end, as any enlargement there would derange the vapour flame; it must also be constructed of platina, as that is the only metal that will resist for any length of time, the heat of the burning vapour.

The air-pipe appears to throw out a pale blue flame, about two inches in length, small and pointed. At the very point of this flame, the oxygen being all consumed, the greatest amount of heat is produced, and fusion of the solder takes place without oxydation; but within the blue flame, or far from it, where oxygen preponderates, oxydation of the solder goes on rapidly.

The necessary weight to be given to the bellows, can only be determined by experiment, as it depends entirely upon the force of the rest of the instrument.

The extra heat gained by the introduction of the air-pipe, is nearly all concentrated at the apex of the blue flame, which may be brought to bear upon the point, to be soldered, while the vapour flame keeps the whole work in a state of readiness."

FIG. 56.



The author has never had an opportunity of testing the value of Dr. E's compound self-acting blow-pipe, but he doubts not that

FIG. 56. *a a* Air-pipe leading from the bellows to the lamp; *b* Vapour pipe; *c c c* A round bellows 10 inches in diameter; *d* A rod attached to the upper moveable head of the bellows and passing through cross piece *e*, which serves to keep the head in a horizontal position; *f* A rod attached in a similar manner to the lower moveable head of the bellows and passing down through the table; *g* A stirrup attached at the upper end to shaft *h h*; *i i* Support for shaft *h h*, by means of an arm projecting backwards from shaft *h h*, and attached to the lower end of rod *f*, the force is communicated from the foot of the artist to the bellows.

it performs well, and so fully is he convinced of this, that he intends procuring one for his laboratory.

Dr. R. Somerby, of Louisville, Ky., has invented a furnace and blow-pipe which every dentist would find exceedingly convenient and useful in his mechanical work-shop.

By the invention of this most useful and valuable contrivance, Dr. Somerby has done the profession a great service. Soldering by the ordinary method is both hurtful to the lungs, and productive of great injury to the eyes. The process of soldering is rendered by far and altogether more easy by this blow-pipe than by the usual method, and is therefore, to those of the profession who are stationary, and occupy themselves much in mechanical dentistry, invaluable. The furnace attached to it answers all the purposes of melting gold, solder, and the metal employed for casts. The frame is made of iron, and so constructed and arranged as to occupy but little room. The smoke from the furnace may be carried off by means of a stove-pipe,—the lower piece of which, however, should be so arranged that it may be raised and lowered at pleasure, and of a conical shape so as to cover the whole of the opening into the furnace. When the furnace is used, this should be raised, and let down when it is not needed. And as useful as is this apparatus to the dentist, it is equally valuable to the chemist and mineralogist, or for any purpose requiring a steady blast from the blow-pipe or heat from a furnace.

The only objection that can be raised to Dr. Somerby's furnace and blow-pipe, is their cost—the price being one hundred dollars, and the author is of the opinion that this amount might be saved by them in a single year by a dentist who has a large practice, so much do they facilitate labour in the mechanical department of the art.

Having fully tested their value, I have no hesitation in recommending them to the profession. The engraving on next page is a correct representation of the two combined.

FIG. 57.

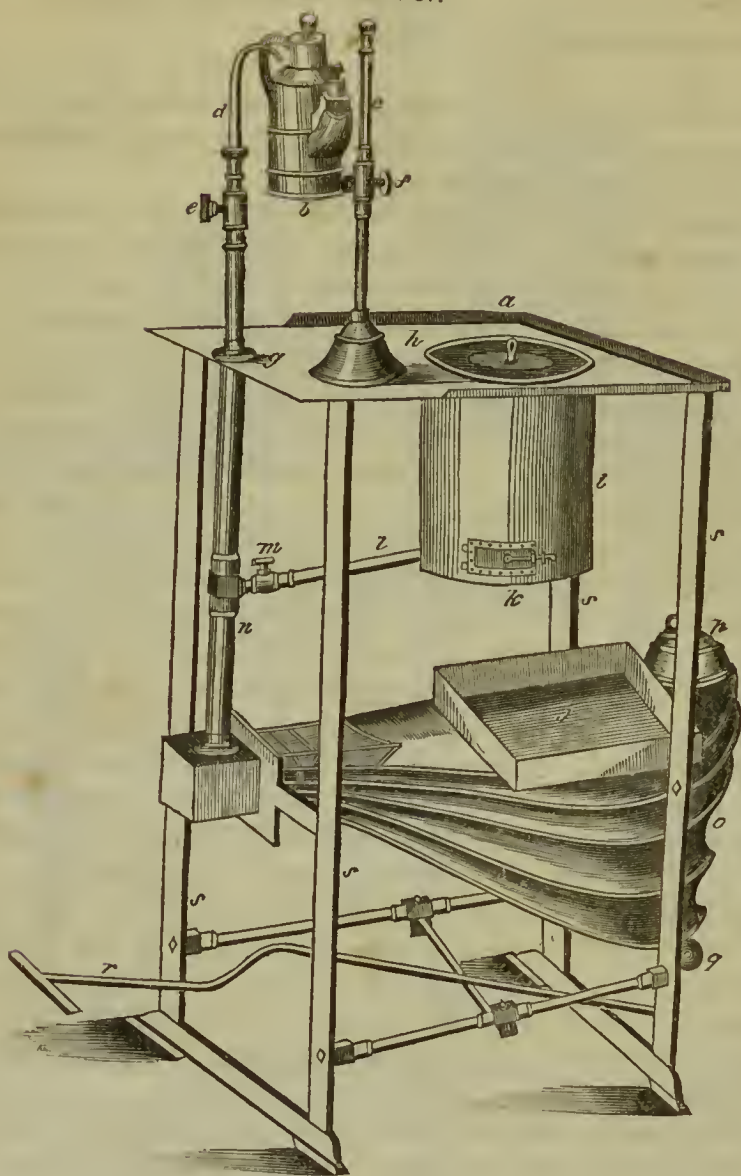


FIG. 57. *a* A perspective view of Dr. R. Somerby's concentrated Blow-pipe and Furnace; *b* The lamp; *c* Lamp stand; *d* Blow-pipe; *e* Cock, to cut off the air from blow-pipe; *f* Slide to raise or lower the lamp; *g* Top of table; *h* Cover to the furnace; *i* The furnace; *j* The pan to receive the ashes from the furnace; *k* The valve at bottom of furnace; *l* The pipe leading from the bellows to the

The edge of the plate and clasps which are in contact with each other, and that are to be soldered together, should now be covered with a solution of suborate of soda (borax) applied with a camel's-hair pencil. The borax should be prepared for this purpose by grinding it in clean water on a piece of glass with a ground surface of from four to six inches in diameter, or on a slate of the same size, until it is of the consistence of cream. Thus prepared, several small pieces of solder should be applied along the point of connection between the clasps and plate.

The solder used for this purpose should be sufficiently fine to prevent its being easily acted on by the secretions of the mouth. Either of the following recipes will be found admirably adapted to dental purposes.

RECIPE No. 1.

FINE FLOWING GOLD SOLDER.

2 dwt. 22 car. gold,
16 grs. fine silver,
12 grs. roset copper.

RECIPE No. 2.

FINE FLOWING GOLD SOLDER.

1 dwt. 15 grs. 22 car. gold,
16 grs. fine silver,
12 grs. roset copper.

For convenience, solder should be rolled into very thin and narrow plates before it is used.

The work being now prepared for soldering and laid on a piece of charcoal, as before directed, the lamp should be lit and the flame thrown, first upon the plaster, and kept there until it is heated to a red heat, then upon the part to be soldered. It should now be brought to a smaller focus and kept steadily upon the work until the solder fuses and spreads itself along the line of connection between the clasp and plate, when it should be in-

furnace; *m* The stop-cock to cut off the wind from furnace; *n* The main pipe leading from the bellows to the furnace and blow-pipe; *o* The bellows; *p* Weight on the top of bellows; *r* The treadle; *s* The table legs.

stantly discontinued here, and thrown upon any other part or parts to be soldered.

To become an expert solderer considerable practice is necessary. If the flame be continued too long, there will be danger of melting the plate, and by an improper application of the heat the solder may be partially fused and formed into small balls. But a little practice will enable the student to determine the quantity of heat required and the length of time it should be continued.

The plaster, after it has become cool, should be removed and put in a mixture of equal parts of sulphuric acid and water, where it should remain long enough for the borax, which will be found adhering to the plate, to be dissolved, and for the cleansing of the gold. But a few minutes, however, will be required for this.

After having made the surface of the solder smooth with suitable scorpers, or scrapers and files, the piece should be tried in the mouth, and if a series of teeth are to be attached to it, a rim of softened wax should be placed on the plate and the patient required to bring his jaws naturally and closely together, imbedding the opposing teeth in it, and while his mouth is closed, the operator should press it carefully around them with one of his fingers. After doing this, the patient should open his mouth and the plate and wax carefully removed and placed upon a piece of paper, with the wax downwards. After oiling the upper side of the plate, plaster of Paris, made into thick batter, in the manner as before described, should be poured on it, and after it has become somewhat hard it should be applied until it is raised an inch above the plate, and it should be extended back of it, on the paper, at least two inches. After waiting about thirty minutes, the plaster should be trimmed; and one or two deep grooves cut across the lower side, which, with the impression made in the wax, should be smeared with oil. Plaster should now be put on this side as on the other, filling the indentations made by the teeth in the wax, and extending it back as far as it was in the first instance, and making it of a similar thickness.

It should now be permitted to remain undisturbed from four to six hours, except that it should be trimmed with a knife, in about

thirty minutes, or before it has become very hard, then the two casts should be separated and the wax and plate carefully removed.

By this simple contrivance, an exact representation of the manner in which the jaws meet is had, and the most accurate and convenient antagonizing model procured that can possibly be obtained, and provided with this, the operator is prepared to select, arrange and antagonize the teeth.

Where a cavity requiring only one or even five or six teeth, is to be filled, it is important that the artificial should correspond in shade and colour, with the natural organs, for in proportion as they are whiter or darker, will the contrast be striking and their liability of detection increased. But of the two, it is better that they should be a little darker than any whiter. Their outer configuration should resemble the shape of those which have been lost.

As they are selected, they should be arranged on the plate, and retained in their place by a piece of bees-wax placed on it behind them. If they do not fit closely to the plate and gum, they should be ground on an emery wheel or small grindstone until they do, and they should be so arranged as to meet the teeth with which they are intended to antagonize, at the same instant that the natural teeth, that have antagonists come together. The antagonizing models will enable the operator to do this with the most perfect accuracy.

The teeth having been thus arranged and adjusted, a gold plate, large enough to cover the posterior surface of each, should be fitted to them in the following manner: each tooth has securely fixed in the back part of it, two platina rivets for the purpose of connecting the plate to it. Each plate, therefore, should have two holes punched through it, by means of a pair of dentists' punch forceps, large enough to admit the rivets of the teeth, and of the same distance apart as they are. The holes on the back part of the plate should be slightly enlarged, and, after placing it on the tooth, it should be made fast by riveting or striking up, with a light hammer, the ends of the platina rivets. The gold backings of the teeth should be slightly hollowed before they are put on, so that they will fit up closely to every part of the back of each

tooth, and the plate employed for this purpose should be about as thick as that used for the elapsps.

After the gold plates have been riveted to the backs of the teeth, they should be accurately fitted to the plate, and retained in their situation by the wax on the plate behind them.

The gold plate, teeth and wax should now be carefully removed from the plaster model and placed on a large piece of chareoal, using the precaution not to disturb or disarrange the teeth. A paste, made with plaster of Paris and water, of the thickness of thin batter, should now be poured round them, until their anterior surface and coronal extremities are covered to the thickness of a quarter of an inch. When this has become hard the wax should be removed from behind the teeth.

If it should be found on the removal of the wax, that the gold backs to the teeth do not all fit down tight to the plate, the apertures should be filled with gold foil. This done, borax, triturated in water, in the manner as before described, until it is of the consistence of cream, should be applied with a camel's-hair pencil to all the parts where it is wished that the solder should take effect, not omitting the platina rivets that pass through the backings of the teeth, for experience has taught me that these cannot be made too secure. They should therefore, be made fast by soldering as well as riveting.

After applying the borax, a number of small pieces of solder should be applied immediately on the line of connection between each tooth and the plate, and one over each rivet.

In soldering the teeth to the plate the heat should be applied by means of a large flaring flame until the whole mass becomes red, and then by one of about half an inch in diameter, thrown immediately on the line of connection between the backing of a single tooth and the plate, and as soon as the solder flows freely here and over each rivet, it should be passed to the adjoining tooth, and so on until the process is completed. When the solder runs in the wrong direction the heat should be increased at the point where it is wished that it should take effect, which will immediately, if a sufficient amount be applied, cause it to flow in that direction.

As soon as the mass has become sufficiently cool, the plaster should be carefully knocked from the teeth and plate, and these last placed in a tumbler or an earthen vessel containing a mixture of sulphuric acid and water, where it should remain until the borax, which by the process of soldering has become almost as hard as glass, is decomposed. This process, jewellers usually term pickling, and when it is completed, the acid should be washed from the teeth, and any rough portions of solder that may present, carefully removed by means of suitable instruments, and the whole made smooth and every part neatly burnished or polished.

But before the final finish is put on, the piece should be boiled one-half hour in a porcelain vessel containing the following mixture:

Pul. Nitrate of Potassa	℥ i.
Muriate of Soda	℥ ss.
Alumen	℥ ss.
Water	℥ vi.

After boiling half an hour in this, and the object of which, is, to decompose the copper in the solder on the surface where it has flowed, it should be boiled half an hour in six ounces of water and half an ounce of sub. carb. of soda, for the purpose of neutralizing the acid, and then half an hour in water for the purpose of removing the soda.

This last process of cleansing was suggested to the author by Dr. Blandin, of Columbia, South Carolina.

In inserting the teeth it often becomes necessary to make some little alteration in the adaptation of the clasps. This, the operator can always effect, if they have been put on the plate with the proper care, with a pair of common pliers, and it should always be borne in mind that they should never be so applied as to prevent the patient from removing and replacing the piece at pleasure. He should be directed to do this two or three times every day, and every time to thoroughly clean the teeth to which the clasps are applied, and it would be well, too, for the artificial

piece to be taken out every night on going to bed, and remain out until morning.

Having now described the manner of constructing a plate, attaching clasps and teeth to it, and of cleaning up and finishing the work, I shall now proceed to notice the manner in which dental substitutes applied in this way should be constructed—giving a sufficient variety of cases, to enable the student to determine on the proper method of procedure in any one that may be likely to present itself.

CHAPTER FIFTH.

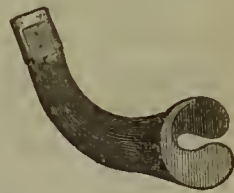
OF THE CONSTRUCTION OF DENTAL SUBSTITUTES FOR SPECIAL CASES.

IN supplying the loss of teeth, the ingenuity of the dentist is often taxed to its greatest extent. No two cases are precisely alike, and therefore, no directions can be given upon the subject from which it will not often be necessary to deviate. The illustrations however, which follow, will, I trust, from their variety, enable the practitioner to construct an efficient and useful substitute for any teeth, the loss of which, he may be called upon to supply.

SUBSTITUTE FOR AN UPPER LATERAL INCISOR.

FIG. 58.

In the insertion of a lateral incisor on plate, the usual practice is to extend the plate back behind the teeth on each side of the mouth to the second bicuspid or first molars, and to secure it in the mouth by two clasps, but this is unnecessary; it can be as securely and firmly fixed by extending the plate back on one side, and clasping it to a single bicuspid or molar, as to two, and besides, when applied in this manner, it is worn with more comfort and satisfaction by the patient. The author has applied single teeth in this way altogether for the last five years, and even for two teeth, he seldom has recourse to two clasps. In extending the plate back into the mouth, it should never be fitted up close around the necks of the teeth it passes, for the reason that it is liable to irritate and inflame the apices of the gums. The author, in common with other practitioners, was in the habit of doing



this for many years, but observing the bad effects that arose from it, he abandoned it about four years ago, and has since, in nearly all the cases which he has had, run the plate about an eighth of an inch back of the teeth which it passed. A correct idea of the manner in which a lateral incisor on plate should be applied, may be formed from an examination of Fig. 58. A cuspidatis or central incisor or bicuspid, should be applied in the same way, and if the second bicuspid or first molaris is rendered unfit, by disease, to clasp to, the plate may be extended back to the second molaris, or it may be even carried across the mouth, and clasped to a tooth on the opposite side.

SUBSTITUTE FOR THE TWO UPPER CENTRAL INCISORS.

FIG. 59.



In the application of the two upper central incisors on plate, two clasps, one on each side, sometimes becomes necessary, although they can oftentimes be securely and steadily held in

their place with one. But generally two should be preferred,—and in which case, the plate should be extended back, like the one represented in Fig. 59, on each side of the alvcolar ridge to the first permanent molares, but if these are defective it may be carried to the second molares, and in case these should be so much impaired by disease as to render them unfit to be clasped to, they need not extend further back than the second or even the first bicuspides. When the teeth are gone on one side of the mouth, they should be extended back on the other and secured by two clasps on that side, as for example to the second bicuspid and second molaris, or to any other two teeth which may offer a firmer and more secure support. Fig. 59 represents two central incisors mounted on plate and intended to be clasped to the first molaris on each side of the mouth. For a similar case in the lower jaw, only one clasp would be required.

SUBSTITUTE FOR THE UPPER INCISORS AND CUSPIDATI.

FIG. 60.



The construction of the plate represented in Fig. 60, is upon precisely the same principle as the preceding, and the only difference is, that the part of the plate on which the teeth are mounted fills a larger vacancy in the alveolar arch. And as in the former case, when the teeth on one side of the mouth are too much decayed, or are incapable of affording a secure and substantial support, even this number of teeth may be secured by two clasps on one side of the mouth, and they are oftentimes applied with but one, but whenever this is done the plate should be extended half or three-fourths of an inch back of the tooth around which it is to pass. If this precaution is neglected, the piece, from its great weight, by acting as a lever upon the tooth, will soon loosen it and cause it to drop.

SUBSTITUTE FOR TWO UPPER BICUSPIDES ON THE SAME SIDE OF THE MOUTH.

FIG. 61.



The way of constructing a substitute for two upper bicuspids on the same side of the mouth, is exhibited in Fig. 61, but when the adjoining first molaris does not offer a suitable support for the piece, the plate should be extended back on the inside of it, and secured by a clasp to the second, and if this also be diseased, or has been removed, the plate should be carried across to the opposite side of the mouth, and secured to such teeth as may there offer the best means of support. But in this, as in other similar cases, the plate should be thick, and adapted with the most perfect accuracy to the parts on which it is to rest. If the clasp or clasps, if more than one is applied, are of the proper width, and well adapted, the teeth will be held firmly in their place, and be worn without the slightest inconvenience.

SUBSTITUTE FOR THE INCISORS, CUSPIDATI AND BICUSPIDES
OF THE UPPER JAW.

FIG. 62.



When the crowns of the first molares of the upper jaw are long and well developed, and in a healthy condition, the loss of the ten anterior teeth may be replaced with an artificial substitute that will subserve the purposes of correct enunciation as well as the natural organs, and

upon which mastication may be very effectually performed. The teeth, however, should be attached to a thick and strong plate, and secured to the first molares by broad clasps. They should also be correctly and accurately antagonized, for upon this last will their utility in a great measure depend. The plate, too, should extend back of the teeth to which it is clasped, and when the second molares and *dentes sapientiæ* are wanting, it should cover the whole of the alveolar ridge, in the manner as represented in Fig. 62, but if these still remain, it should rest upon the gums on the palatine side of them. It should not, however, touch them.

SUBSTITUTE FOR ALL THE UPPER TEETH, EXCEPT ONE
MOLARIS.

FIG. 63.



The dentist is sometimes called on to replace the loss of upper teeth, when there is only a single molaris remaining. It would unquestionably be better, in cases of this sort, to remove the remaining tooth and apply a whole upper set on the atmospheric pressure principle, but this, he is not always permitted to do, and is compelled to make it the means of support for a substitute for all the other

teeth. In securing a plate sustaining so many teeth, Dr. S. Brown very judiciously directs that it should be very thin and closely fitted to the gums. The teeth, too, he says, should be thin. The author has applied upper sets of teeth in this way, which are worn without the slightest inconvenience, and that have realized his most sanguine expectations. As in the case of the description of dental substitute last noticed, the clasp should be wide, and accurately fitted to the tooth, (see Fig. 63, in which is represented a set of teeth of this description.)

SUBSTITUTE FOR THE TWO LATERAL INCISORS, TWO BICUSPIDES AND THE FIRST MOLARIS ON THE LEFT SIDE OF THE MOUTH IN THE UPPER JAW.

FIG. 64.



It often happens that there are several vacuities in the alveolar ridge which the practitioner is called on to fill, and the insertion of artificial teeth in cases of this description always require more judgment and mechanical tact and skill, than in filling only a single aperture.¹ After obtaining a plaster model in cases of this kind, all the teeth should be removed from it before metallic casts are made, and a plate swedged up over the whole ridge and the parts of it which cover the places occupied by the remaining teeth, filed out in the manner as described in another place. The accompanying cut, however, will serve to illustrate the manner of constructing dental substitutes for all cases of this nature, but this, as may be perceived, is intended to be secured in the mouth by two clasps on one side of the alveolar ridge,—all the teeth on the other having been lost.

The plate, in the case here represented, might have been extended further back, and the second and even third molaris replaced, but they were dispensed with, for the reason that there were no teeth farther back in the lower jaw than the first molaris to have antagonized with them, had they been inserted.

CHAPTER SIXTH.

CONSTRUCTION OF A DOUBLE SET OF ARTIFICIAL TEETH WITH SPIRAL SPRINGS.

FIG. 65.



By a double set of artificial teeth, is meant a substitute for all or the greater part of the natural teeth of both jaws; and the usual method of confining them in the mouth, is with spiral springs, one on each side, attached at each end, to each circle of teeth. When correctly constructed, and applied under

favourable circumstances, they are valuable and efficient substitutes for the natural organs, but when badly constructed, as they, in the majority of cases, are, and applied under unfavourable circumstances, they are productive of constant annoyance to the patient.

It often happens, that the loss of the teeth results from disease in the gums and alveolar processes, and when this happens, the latter are so much wasted and destroyed that the ridge in the lower jaw is scarcely perceptible and becomes covered with loose folds of mucus membrane. In cases of this description, the application of a dental substitute often becomes exceedingly difficult. The pressure of the apparatus is apt to cause irritation. But this difficulty may, in most cases, be obviated by using a thick plate, fitted accurately to the parts and extended back to the coronoid processes. It should also be applied without springs.

The upper plate should be about one inch in width, and the

lower as wide as the shape of the ridge will admit of its being made. The lower plate should be fully twice as thick as the upper, and made from gold at least twenty-two carat fine. Twenty carat gold will do for the upper plate.

After having accurately fitted both plates, the operator should proceed to obtain an antagonizing model by placing a rim of soft bees-wax between the convex surfaces of the two plates, of about one inch and a quarter in width. He should now ascertain the length he intends to have the teeth, make a thin wedge from some soft wood, in width, exactly corresponding thereto, pass it through the wax between the plates at the medial line, put the whole in the mouth of the patient, adjust the plates to their proper places on the alveolar ridges, then direct him to close his jaws naturally until the plates are brought in contact with the edges of the wood. This done, the whole should be removed from the mouth, the plates oiled, and a plaster model obtained by first filling one side and then the other, in the manner as before described.

But before the wax and plates are put in the mouth, the patient should be cautioned against closing it improperly, for if he projects the lower jaw anteriorly, or closes it on one side, the artificial teeth will not antagonize properly.

After having obtained a correct antagonizing model, the operator should place a rim of bees-wax on each plate, against which he should place the teeth as he selects them, beginning with the central incisors, the upper first, then the lower, next the lateral, afterwards the cuspidati and bicuspidates, and lastly, the first and second molares,—twenty-eight being the number usually employed for an artificial set.

The teeth should be fitted in the most accurate manner to the plates, and in doing this, it almost always becomes necessary to grind them on a small emery wheel or grind-stone.

After the teeth have been arranged, and fitted to the plates, and the gold backings put on, they should be secured with plaster, the wax removed, and the process of soldering and finishing performed in the manner as before described.

But before the teeth are soldered to the plate, the attachments for the springs should be fixed to the outer edge of the latter on each side, against the second bicuspidates, or partly between them

and the first molares. The description which the author prefers, so regulates the motions of the springs, that they are prevented from coming in contact with the outer surface of the alveolar ridge on the outside of the plate, or from turning out towards the cheek, and irritating its lining membrane. Their construction is so plainly exhibited in the accompanying cut, as well as that of the eyelets and springs, that no other description of them is deemed necessary.

FIG. 66.



The principle upon which the springs act is exhibited in Fig. 65, and by which it will be perceived the upper and lower rows of teeth are constantly but gently pressed against the parts on which they rest.

The wire for the springs should never be thicker than is absolutely necessary to give the requisite degree of power, and the coil should not exceed a tenth or at most an eighth of an inch in diameter. The length of the springs must be determined by the peculiarity of the mouth. In some cases it is necessary to have them much longer than in others. The usual length, however, is from an inch and a half to two inches.

The simplest and most convenient method of winding the wire is to secure it between two blocks of wood, as described by Dr. Brown, held in a small bench-vice, while the upper end is grasped by a hand-vice or pair of sliding-tongs, in connection with a small spindle or steel wire about "the size of a common knitting needle," and six or eight inches in length. This, with the end resting "on the wooden blocks," is made to revolve by turning the hand-vice or sliding-tongs, and by this movement, the gold wire is wound firmly and closely around the steel rod.

It often happens that six or eight teeth in the front part of the mouth in the lower jaw remain healthy and firmly fixed in their sockets, after all the other teeth are lost. In this case, the lower

plate should be so constructed as to cover the unoccupied portions of the alveolar ridge and to fit its upper and inner surface behind the remaining natural teeth. This part of the plate should be strengthened by soldering to its outer surface another plate of equal or even greater thickness.

But when the lower incisors, cuspidati and two of the bicuspidates are remaining, it is better to dispense with the others than encumber this part of the mouth with artificial substitutes. The upper teeth should be replaced but not the lower, and when there are but six remaining in the inferior maxillary, it would be better to remove them and insert an entire dental apparatus, as it is exceedingly difficult and sometimes impossible to replace the others in such a way as to render them serviceable while the front part of the jaw is occupied with natural teeth.

CHAPTER SEVENTH.

CONSTRUCTION OF DENTAL SUBSTITUTES ON THE ATMOSPHERIC PRESSURE PRINCIPLE.

FIG. 67.



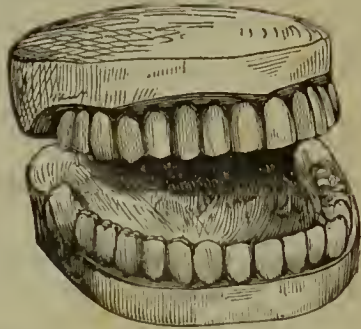
FIG. 68.



THE engraving, Fig. 67, represents the appearance of a dental substitute for all the upper teeth, when ready for insertion, and Fig. 68 exhibits that of the plaster model of the alveolar ridge and roof of the mouth of the individual for whom the teeth, from which the first of these drawings was made, were intended. The only difference between teeth applied upon this principle and with spiral springs is, the plate in the former should be rather wider than it is necessary to have it in the latter. It should cover the whole of the outer surface of the alveolar ridge, and a small portion of the roof of the mouth, but it should not go as far back as most dentists are in the habit of extending it, for the reason that a very wide plate cannot be as perfectly and accurately adapted to the parts as one of moderate width. Unless it be made to touch every portion of the surface of the parts which it covers, it will be constantly liable to drop. A narrow plate, well fitted, will adhere much more firmly than a very wide one, imperfectly

adapted. The successful application of artificial teeth upon this principle depends upon having the plate closely fitted to the parts upon which it is to rest.

FIG. 69.



In the application of a double set on this principle, the lower plate, as I have before stated, should be as wide and long as the alveolar ridge of the inferior maxilla will admit of its being made. Fig. 69 represents a dental substitute of this description in an antagonizing model of plaster of Paris. The posterior extremities of the lower plate, as may be perceived, extend up about half an inch on the coronoid processes. The lower alveolar ridge of the individual (a lady) for whom this dental apparatus was constructed, is almost wholly wanting, and each side is covered with loose folds of mucus membrane, which is so irritable as to prevent the lady from wearing artificial teeth applied with spiral springs. The set here represented she has worn for nearly three months, without having experienced the slightest inconvenience.

In the substitution of artificial for the loss of the natural teeth, of either or both jaws, this method, when it can be advantageously adopted, and there are few cases in which it cannot be, is preferable to any other.

When the teeth are put in the mouth, the patient should be directed to exhaust the air from between the plate or plates, when a double set is applied upon this principle, and gums, which, if properly fitted, will at once cause them to adhere.

CHAPTER EIGHTH.

MANNER OF ATTACHING NATURAL TEETH TO A PLATE.

NATURAL teeth may be mounted on a plate, constructed in the same manner as described for the porcelain, and secured by means of screws or rivets. The latter, however, are preferable to the former. They may be also secured in the following manner: A gold plate is to be made of the size of the space intended to be supplied with teeth, and about an eighth or sixth of an inch in width. To the inner circle of this, the flat side of a half round gold wire must be soldered, each end of it extending far enough back to form a clasp around the tooth to which it is intended to be attached. The teeth are next to be selected and fitted on the model, and then with a saw, of the thickness of the plate, a horizontal groove is cut across their posterior surfaces, so that the plate may be let into them up to the wire, which is afterwards to be made fast by means of rivets, two in each tooth. This done, all that remains is to fit the ends of the wire up close to the teeth, on each side of the vacuity, and around the ones they are designed to encompass.

This method of mounting natural teeth, however, is not so good as the one first described, yet if it be properly done, and the mouth in which they are placed be healthy, they may, for a few years, answer tolerably well. Teeth inserted in this manner, however, seldom endure very long, because the groove into which the plate is set, receives and retains the juices of the mouth, and thus causes them to corrode the teeth. When these teeth are mounted in the manner as first described, the secretions of the mouth, it is true, get between them and the plate, but then only one surface is exposed to their action; whereas, those that are inserted in this

manner, present three, namely, that which rests upon the gum, and also one on each side of the plate.

But the first method is preferable for the reason that the gum is pressed upon by a broad well adapted plate, whereas, when they are fastened in the manner last described, it is pressed upon only by the ends of the teeth, which are productive of more or less irritation.

The porcelain teeth, however, having, since the late improvements made in their manufacture, almost wholly superceded the use of all other dental substitutes, it is not necessary to enter into a more minute description of the manner of mounting natural teeth on plate.



CONCLUSION.

Having now treated of the various surgical and mechanical operations, connected with the Dental Art, it may not be amiss, in conclusion, to offer a few remarks on the order in which they should be performed; for upon its due observance, the attainment of the advantages to be derived from them, will, in a great measure, depend.

If the mouth is involved in a complication of disease, and the curative indications be neglected, it will be of but little consequence how well a single operation may be mechanically performed. When a tooth is decayed, the gums around it turgid and spongy, and no means are employed to restore them to health, the mere plugging of the tooth will be of no avail; for, as diseased gums cause the teeth to become loose, and drop out, the destruction of the tooth will be almost as certainly effected, as if no means had been used for its preservation. Nor would our efforts be attended with greater success, were they to be directed to the restoration of the gums alone; for then the caries would still be progressing, and would ultimately occasion the loss of the tooth. It would be equally useless to attempt the preservation of a tooth

that was decaying in two separate places, by operating on one of them, without also, at the same time, attending to the other.

In short, the treatment must be thorough, and persisted in, until both the teeth and gums are restored to health. The judicious practitioner will, therefore, consider well the remedies indicated by the diseases of each, and observe that order in their application, which promises not only relief to one, but the most permanent cure to both.

The operator is sometimes prevented by his patient from pursuing the course of treatment his better informed judgment dictates. In cases of this kind, he should distinctly inform them of the treatment proper to be adopted; and if then they are unwilling to submit to it, he should positively decline rendering his services. This he ought to do, in justice not only to himself and patients, but more especially to the professional body of which he is a member, and which has suffered so much from obloquy heaped upon it, on account of ill advised and badly conducted operations.

It is not only necessary that all the operations required should be performed, but that they be performed at the proper times; otherwise, the benefit that is to be derived from each, will be lost, and, in some cases, the mouth be left in even a worse condition than it was before.

The practice of extracting, cleansing, plugging, and inserting teeth, at one and the same sitting, especially when the gums are spongy and inflamed, is often productive of much mischief, and cannot be too severely censured. Whenever, therefore, all these operations are required, the following order should be observed in their performance.

First. Extraction and cleansing should precede all other operations. For the completion of the latter process, several sittings are often required. It may, however, in such cases, be commenced at the first sitting, either before or after extraction, and carried as far as circumstances will admit; and then be resumed, at intervals of three or four days, until it is completed. But we should not, in the mean time, neglect to adopt such medical and surgical treatment, as may be necessary to the restoration of the gums to health.

Second. After the gums have become healthy, such of the remaining teeth as are decaying, should next demand our care.

Third. The gums and teeth having been restored to health, we may proceed to supply, with artificial teeth, such losses of the natural organs, as may be required.

Instances, it is true, do sometimes occur, where the performance of these operations at the same time, would be perfectly proper; but then there are many more, where it would be extremely injudicious. The following case may, perhaps, serve to illustrate the consequences, that may generally be expected to follow too hastily conducted operations on the teeth and gums.

In the spring of 1834, Mr.—, of N. Carolina, accompanied by his daughter, called on me, with a request that I would examine her teeth, and perform such operations on them, as might be required. Upon an examination of her mouth, I found several of her teeth were so much decayed, that their restoration to health seemed impracticable, and nearly all of them were coated with tartar, which, around many, extended down to the alveolar processes. Her gums were swollen and inflamed, and the crowns of the upper incisors so much decayed, as to require artificial teeth to be substituted in their place.

Under these circumstances, I informed her father that it would require two weeks, at least, to complete such treatment as was necessary to the health of her teeth and gums. He, however, was obliged to leave the city in two days, and therefore requested me to proceed as far with it as I could in that space of time; but as the insertion of the teeth seemed to be a paramount consideration with the young lady, I wholly declined rendering my services.

They, therefore, left me; the father with a determination not to have any thing done to her teeth, until an opportunity should offer to have them properly treated; and she, with her desire for the insertion of the artificial teeth, but little or not at all diminished. Accordingly she prevailed on him to call with her on another dentist, who not only inserted the incisors, but also plugged several of her teeth, and pretended to remove the tartar, which perhaps he did, as far as it was possible, at only a single sitting.

In May, 1835, the same gentleman again called on me with his

daughter, whose mouth was now in a much worse condition than when I first examined it. The hasty manner in which her upper front teeth had been inserted, gave rise to the formation of three alveolar abscesses, from which an almost constant discharge of matter had since continued. Finding the extraction of the roots, upon which the artificial teeth had been placed, was necessary, I accordingly removed them; and, in the performance of such other operations as were required, observed the order which has been just recommended; and in about five weeks had the satisfaction of seeing the health of her mouth entirely restored. The loss of the front teeth, however, was not repaired until the following fall, she not being able to remain in the city a sufficient length of time to allow the alveolar processes to be entirely absorbed.

I have not selected this case because of any peculiarity it possesses, not in common with others; but simply because I would impress on the mind of the young practitioner the importance of not performing too many operations at a time.







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